Report
Provincial Board of Health
Ontario
1906

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OF THE

Provincial Board of Health

Of Ontario

(Canada)

BEING THE

TWENTY-FIFTH ANNUAL REPORT

FOR THE YEAR

1906

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO.

TORONTO:
Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty
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Provincial Secretary.

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Charles Alfred Hodgetts, M.D., L.R.C.P., Lond. Secretary and Chief Health Officer of Ontario.	Toronto

Bacteriologist in charge of Laboratories.

John A. Amyot, M.D.

Medical Inspector.

R. W. Bell, M.D.

The Chairman and Board were appointed by Order-in-Council dated September 28th, 1906.

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Chairman's Annual Address.

E. E. KITCHEN, M.D., St. George.

Delivered at the Quarterly Meeting held February 2nd, 1906.

Another new year has arrived, and with it, our first meeting for 1906.

This constitutes the 24th annual address delivered to this Board since its inception, and when we consider the wonderful strides, made in Sanitary Science, during this period, nearly a quarter of a century, and contrast our knowledge and the vastly improved conditions, with those of 1882, we are amazed and proud of what has been consummated. Of all those years, none can show better practical work than the one which we are closing.

The health for the year has been fair. A better understanding of the prevailing conditions of contagious diseases may be arrived at, by careful attention to the following summarized statement.

During 1905 there were 547 cases of smallpox, with 5 deaths, while the record for the previous year was 309 cases with 4 deaths. The largest number was in November, being 183, while but 8 cases occurred in each of the months of February, July and August.

This is a preventable disease, and would soon become only a matter of history, if our people showed enough intelligence to reap the reward of proper vaccination. While we, with our boasted knowledge in educational and financial matters are losing large sums every year, Germany and France have the proud distinction of having eradicated this loathsome disease from within their boundaries.

Childhood vaccination and re-vaccination on approaching manhood would do the whole business. The yearly financial loss to our people, during the past few years of a mild form of smallpox must have been very large.

There have been 1,420 cases of scarlet fever, during the same time with 62 deaths, only about one-half of last year, which numbered 2,158 cases, with 129 deaths. The greatest number of cases, 223, occurred in January, while the least in any month, 27, was in September.

There was a considerable lessening in the number of that formerly dreaded disease, diphtheria, there being 2,140 cases during the year, with 367 deaths, while 1904 had the large number of 3,045 cases with 438 deaths. Again January takes precedence, as having the largest number of cases, 412, while July records the smaller number of 128. Anti-toxine freely and early used should make this number very much smaller.

Measles are reported in larger numbers than for years, being 2,576, with 64 deaths, while last year reported only 526 cases with 32 deaths.

Whooping-cough reported 751 cases and 109 deaths which was greatly above last year, being only 279 cases and 90 deaths.

As so many cases of measles and whooping cough do not come under the care of the physician, or Medical Officer of Health, except those that are seriously sick, or that die, there is no doubt, a large number of cases that are never reported.

Typhoid was slightly in excess of the last few years, being 1,588, with 358 deaths, while last year we had 1,262 cases with 397 deaths, which is unfortunately a higher death rate. There were no less than 350 cases reported for October alone, while March had but 30, the least of any month in the year.

This is another preventable disease, and if water supplies were purified, we would soon have but little of this fatal malady. It is astonishing, that

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This is another preventable disease, and if water supplies were purified. we would soon have but little of this fatal malady. It is astonishing, that such a large number should go on drinking from a water supply of the purity of which they are suspicious, or even after such supply has been reported by the bacteriologist as contaminated.

I wish to mention another of our contagious diseases. I refer to Tuberculosis, which has a larger death list than all the others just mentioned combined. There were 2,231 cases reported during 1905 with 2,050 deaths, while last year there were 2,165 deaths, being 115 more than this year. The greatest mortality in any one month was in June 207, while the three months prior to June had each about 200 deaths. The lessened death rate even in Ontario is quite perceptible, while Prussia's death rate dropped from 31 in 1886 to 21 in 1900 in every 10,000. This is attributed to the widespread knowledge of its infectious character, the provision of Sanatoria for the working-class, and the early and systematic resort to Sanatoria, which the Workingmen's State Insurance Department encourages and assists.

Last year we were encouraged at the prospect of a number of Municipal Sanitoria but none of them have started except Toronto. True, Hamilton looks as if she meant to have hers in operation during the coming season. Although the Government's offer to counties and groups of counties is very liberal, still there is but little life in the municipalities in building Sanatoria.

If a bonus costing more is wanted for a manufactory, but a few weeks are taken, before it is granted, while the building of a Sanitorium, and its proper conduction which would yield returns far in excess of any manufactory, besides giving us a more healthy and happy people is left in abeyance.

I cannot leave contagious diseases without referring to cerebro spinal meningitis. During the past year this rather fatal malady has been endemic in a number of places in Ontario. Bacteriologists report that the bacteria is found in the secretions of the nares and fauces for at least two weeks. The Board has acted promptly by giving instructions that this disease should be treated as contagious.

Our summer resorts have been looked into very carefully this past season, and as Muskoka is not a municipality, it would be well if a District Medical Health Officer were appointed to look after sanitary matters in that natural and beautiful summer home. A little oversight just at present, in its sewage and its water supply by such an officer might result in great gain both from the standpoint of health and money.

While the sewerage and water systems of the Province are making slow progress, we find that many municipalities are very defective in sending in their plans to this Board, not realizing that they cannot proceed with their work, until they have its sanction.

More care is being exercised in preventing the pollution of our streams and the forming of nuisances, so that little trouble is being caused from these sources.

It will be noticed that great care is being exercised in New Ontario, and if our instructions are properly carried out at Cobalt and other mining and wood camps, disease should be fairly well prevented at those places during the coming season.

The dairy interest is a live one in this Province and it is well known that vast improvements from a sanitary standpoint could yet be made which would greatly increase the financial output. The time is thought by many to be opportune for our Board to take a more active interest in this department.

Our Laboratoy has done good work during the past season and as a diagnostician is invaluable. Its reports on jams and foods generally as well as on patent medicines have been of great assistance and have shown emphatically that every package should on the surface, inform the purchaser correctly, what its contents are. Two or three suits have been taken against grocers for having substances in their foods not advertised. In our estimation these suits should be against the makers of the articles.

It does not appear to be well known, that our Laboratory has nothing to do with the University of Toronto, except that we have rooms rented from them for which we pay a cash rent. In connection with this I am reminded that Kingston and London have applied to Parliament for $75,000 and an extra $7,000 for maintenance to establish a School of Biology and Public Health. It seems to me, far out of the way, that these places should expect to have what the Provincial University has not.

As far as a Laboratory is concerned, our own is able to do at present the work of the Province. If these cities want laboratories why not establish them, as Toronto and Ottawa have done, and pay for them out of their municipal treasuries, as these cities do. But a more natural and economic way would be to follow out, what this Board for years has worked for, to establish County Officers of Health, with a Laboratory in each county town. Then the expense would come upon the parties who get the benefit, and with the least loss of time.

The Museum is being gradually augmented by many valuable and peculiar specimens. The curator will be glad to receive any additions in this special line.

The committee on Legislation has done a great deal of careful work, in going over the Health Act, and supplying deficiencies and making such changes as the lapse of years and altered conditions has made necessary.

The formation of our sewage and water supply committees, into the Committee east and west, is an improvement, and I hope that the calling of committees together, the day previous to the quarterly meetings of the Board, you find advantageous.

The full and detailed reports of the Secretary, Inspector and Bacteriologist cannot be spoken of in too high terms, and it is a great boon to this Board to have such able, careful and painstaking officials.

Quarterly Report of the Secretary.

CHAS. A. HODGETTS, M.D.

Presented at the Meeting of the Board, held January 31st, 1906.

To the Chairman and Members of the Provincial Board of Health of Ontario:

At the threshold of another year we are enabled to take a retrospective glance at the ravages contagious diseases have made during the year 1905, and make comparison with similar returns for the preceding two years—see tables appendix "A".

It will be observed these monthly returns as made by the Board are upon the whole most satisfactory as regards the total number of municipal clerks making their returns, for at least 90 per cent. of the total population of the province is reported upon each year, thus enabling the Board to arrive at a fairly accurate estimate of how far the medical men of the province and the public generally observe the law re notification.

In arriving at any mortality rates the Board must, however, await the compiling of the mortuary returns of the Registrar-General, as very frequently in rural municipalities all the death returns have not reached the Division Registrar at the time of sending in his monthly returns; for health purposes the former figures are accurate enough.

The diseases which show a decline in 1905 of reported cases as compared with 1903 and 1904, are scarlatina and diphtheria. In the former disease with 3,677 cases there were reported 529 deaths in 1903, which dropped in 1904 to 2,165 cases with only 129 deaths; while in 1905 with 1,420 reported cases only 62 deaths were returned, indicating upon the whole a lessening in the virulence of the disease coincident with a decline in its case incidence.

Diphtheria on the other hand, while showing a steady decline in cases, viz., 1903, 3,599; 1904, 3,045; 1905, 2,640 presents about the same mortality, being 14.3, 14.3 and 13.9 per cent. in each of the several years.

The two diseases which have for the past three years being showing an upward tendency are

First—Wooping-cough, 158, 279 and 751 respectively, for the years tabulated. Judging, however, by the death returns the increase would apparently be due to a better reporting of cases, for the deaths in 1903 were 148, or only ten less than the number reported; while in 1904, 90 deaths occurred among 279 reported cases, and only 109 deaths in 751.

Second—Enteric fever, which it is to be regretted, shows a steady upward rise in both cases reported and deaths returned, the figures for the province standing as follows:—

Year.	Cases Reported.	Deaths Returned.
1903	1,012	298
1904	1,262	397
1905	1,588	358

While this preventable disease has been pretty generally reported as prevalent in nearly every portion of the province, yet there are exceptions where municipalities have been free from its disastrous influences.

This pleasing fact is no doubt in a large measure due to the purity of the drinking water, as also to the quality of the milk supply in these districts.

On the other hand typhoid fever has been somewhat more prevalent in the following places,—than should be the case if the health authorities were fully alive to the fact that to them is entrusted the health of the people: Port Arthur, 100 cases; Fort William, 85 cases; Pembroke, 64 cases; Parry Sound, 59; Copper Cliff, 51; St. Catharines, 40; Brantford, 39, Sarnia, 31; Owen Sound, 27; Rainy River, 37, and it therefore behooves the authorities of these muicipalities to make careful study of their water and milk supplies, and for this purpose they should without delay engage the services of a recognized sanatarian whose duty it would be to go carefully into the question and report to the municipal authorities.

The occurrence of enteric fevor in the rural municipalities points to the necessity which exists for greater care being exercised by farmers and others in the selection of well water, and the adoption on their part of better methods for the disposal of house waste, the greater care in the management of barn yards, cow sheds and stables. They must be reminded that "the well" should, and must be so situated that pollution is impossible from any of these, and that the closet or privy pit requires their constant attention if pollution is to be avoided from this source.

No well ordered farm to-day but should have its reservoir of pure water and the disposal of all sewage by means of septic tank and the subsurface disposal of the sewage. And the public requires for its protection that no farmers who keep cattle for the supply of milk to dealers or private customers but should be required to satisfy the local health authorities upon these and other equally important points before they are licensed to carry on their business.

My experience leads me to believe that the fact is too often lost sight of that rural water supplies, which a few years ago were pure, have become impure either through the long residence of the farmer himself and the accumulation of human and animal excreta upon the premises, or by reason of the spring becoming polluted in its passage through pasture land, and by seepage from old and overfilled pit closets—impure and unfit for use either for man or animal. These are, however, in many instances used by the owner and his family with impunity, from the fact that their constant use has given them a degree of immunity which is not possessed by those who take it for the first time or imbibe the infection it contains, which infection has been carried by means of milk cans washed in the same, the milk being a good nidus for the growth and propagation of the bacteria found in the water.

As example of the reliance to be placed upon the returns for enteric fever I would refer to those received from the City of Toronto, which were as follows,—197 cases and 40 deaths. This return is from a municipality having one of the best organized systems in the Province, and when the Medical Officer of Health has notified the hospital authorities of their duty as regards notification under the Public Health Act. How far they have complied with the request of Dr. Sheard may be gleaned from the following figures which have recently been obtained from the hospital authorities

Hospitals.	Cases.	Deaths.
General	108	12
St. Michael's	103	4
Grace	87	8
Western	80	7
Total	378	31

A mortality rate of 7.89%

These returns show that 378 cases were treated in the hospitals alone. It must not be forgotten some of these caes have been reported by the medical men who were in attendance upon them before their removal to hospital, while others came from outside municipalities by reason of the advantages derived from hospital nursing—allowing for these deductions we find there were in the neighborhood of 500 known cases of enteric fever in place of 200 as reported. Of the large number of unreported cases no one can speak with certainty, but from the knowledge I have of the city it is safe to say that with 500 reported, only half the tale is told, as many of a mild type passed unnoticed, those of which there is a record being of the more severe type such as requiring hospital attendance and nursing.

Applying the figures of the City of Toronto to the promised returns, there would have been 7,000 cases instead of 1,600. The estimate is a conservative one, for I am satisfied the correct figures, if obtainable, would greatly exceed these.

Looking at these figures one of three conclusions will be possible, either the type is very severe, or but a tithe of the cases are reported, or the physicians of the Province are not so expert in treating the disease as are those of other countries. If any one is so cruel as to make this latter charge, then the medical men have but themselves to thank for their neglect to report all cases to the health authorities as required by the Public Health Act.

Measles. This disease has been more prevalent in 1905 than for some years—86 cases being reported in 1903 when 53 deaths were registered, a fact which clearly indicates the reporting of this disease in that year was almost entirely ignored. In the following year a still further improvement is noticeable for 526 cases were registered with 32 deaths, and in 1905, 2,576 cases were accounted for with 64 deaths.

Smallpox. The returns for the three years for this disease were as follows: —

Year.	Cases.	Deaths.
1903	820	21
1904	309	4
1905	547	5

The difficulties met with in this disease have been repeatedly shown by Dr. R. W. Bell, Medical Inspector of the Board, in the interesting reports presented by that officer.

During the year 1905 many outbreaks have been reported from different portions of the Province. In nearly every instance the first case had not been reported to the local health authorities either from the fact the illness had not been of sufficient seriousness to cause the services of a physician to be called in, or as has too often occurred before a diagnosis has been made of chickenpox, poison ivy, eczema or some other disease by the attending physician, with the result that physician, patient and family have lived in a fool's paradise, no precautions being taken to vaccinate the unprotected or to prevent the exposure of other members of the household, visitors, or of those coming in contact with the convalescing one,—the greater number of whom were unvaccinated. Thus insidiously in this favourable field the disease has spread, often confined to the municipality in which it began but more often carried to others some distance remote, until a case falling into the hands of a physician with more exact professional diagnostic skill has reported a case to the local health authorities when investigations pursued by Dr. R. W. Bell, Medical Inspector, has led to the institution of protective and preventative measures in those municipalities where often for weeks the disease had run its course undetected.

As may be imagined the difficulties met with under these circumstances have been many, aggravated, however, when the local practitioners have shown any marked opposition to the diagnosis, and as an example of how strong this has been I would mention the fact that a practitioner in an eastern village, M. H. O. of the township, although suffering from smallpox which he had contracted from patients he had been attending for chickenpox, would not admit the true character of his illness, although the eruption at the time I saw it presented the typical characteristics of the discrete form of the disease.

Notwithstanding the difficulties of both a professional and public character, I am pleased to state the progress of the disease has never been at any time alarming, for in no instance has it got beyond the powers of the local health authorities to handle without any prolonged assistance from this Board. The measures adopted in every case being vaccination, isolation, quarantine and disinfection.

Surprise has been expressed by some that this disease should, after the lapse of six years since its first appearance in Essex County, still continue in our midst. To those ignorant of the true condition of affairs there is no need of surprise, when we consider the many thousands of unvaccinated and the still larger number who have not been revaccinated since the operation was performed upon them in infancy or childhood, resident in Ontario.

Certainly had it not been for this Board insisting on the prompt enforcement of vaccination, the report would be much different than it is, and municipalities would have to face larger expenditures than have been reported; and I would draw public attention to the fact that the neglect on their part and the failure of municipal authorities to enforce the Vaccination Act is the one cause of their having to pay the thousands of dollars, already spent to suppress the disease wherever it has occurred. On the other hand had this wise preventative measure been enforced the disease would by this time be unknown in the Province, and not a dollar need be spent in curing what could, and should be prevented by vaccination and revaccination.

TUBERCULOSIS AND CONSUMPTION. A glance at the returns from this disease shows the interest which is being taken by the medical men of Ontario in the benefit to be derived, not to themselves but to the public, by a reporting of cases, while the numbers reported are in each of the years 1904 and 1905, but slightly in excess of the death returns, yet small as the figures are it must be remembered the reporting is voluntary, and I can but express the hope it will not be long before the same will be made compulsory, not for the purpose of giving publicity as to the extent of the disease or its presence in any particular house, but to permit of local authorities reaching each and every case to give instruction and advice, not only to the sufferers themselves but to those of the same household as how best to protect the former against the insidious progress of the infection, and at the same time give local authorities an opportunity to disinfect infected homes both before and after they are vacated, and before they become the abode of others, who may innocently become infected if disinfection were not resorted to.

The following figures 1903, 2,072; 1904, 2,165; 1905, 2,050 show "the white plague" has claimed nearly the same number of victims as in two preceding years, and so far as can be estimated there is no stemming of the tide. How could it be otherwise? For the municipalities of this Province have literally done nothing either to mitigate the suffering caused by the scourge, or to prevent its onward progress. True it is, public attention has been directed to the fact that the disease is infectious, and it is to be regretted this bald fact has gone forth spreading undue alarm generally, with the result many tuberculous and consumptive persons are shunned, and often householders are put to considerable loss and inconvenience from the fact that the particular house in which a tuberculous or consumptive patient has resided, frequently remains unlet or unsold, although the owner has often spent considerable in cleaning and refitting; and hospitals have refused to receive those suffering from the disease.

This alarm borne of ignorance is deplorable and much to be regretted, and it has no doubt been encouraged by the prominence given to the sanatorium method of treatment, whereby the public have been led to believe the only safe place for each and every consumptive or tuberculous person was a sanatorium. What we as sanitarians have to do is to educate the people how to maintain clean homes, clean schools, clean workshops, and clean factories. The necessity of pure fresh air at all times, day and night, whether asleep or awake. That fresh air and sunlight, with proper food, properly prepared (cooked), also good, pure milk, with proper clothing, are the essentials, first and last—in preventing the tuberculous becoming consumptive, to permit a possibility of their cure, and to strengthen and build up the health of those exposed to the infection so that there will be little danger of the tubercle bacilli finding a nidus in their systems.

Compulsory Vaccination and Re-vaccination.

As the present Act in some particulars is somewhat cumbersome, and doubtless owing to this fact has become inoperative in many municipalities, I would recommend and strongly urge its repeal, and the substitution therefor of a measure which would make vaccination compulsory in infancy and revaccination obligatory before the child reaches the wage-earning period of life, and attendance at school or college of any kind should be dependent upon the production of properly endorsed certificates of the M. H. O. The fine for non-compliance with the Act should be a minimum of not less than five dollars and costs, and subsequent fines of larger sums. In this or some such manner alone can we hope to place Ontario free from smallpox and to do so would be to put us in line with the wise and beneficent laws of Germany, France, Italy, Japan and other enlightened countries, which have recognized the great importance to their people of Jenner's great discovery made over one hundred years ago, and which to-day stands pre-eminently forth as the greatest boon to humanity.

The Pollution of Water Courses.

For many years past this Board has approved of the installation of sewerage systems in which, in most instances, there was no provision for the treatment of the sewage, but the raw effluent was permitted to be run into a river or lake. As a consequence we find after the lapse of several years the conditions in many parts of the Province are not satisfactory, either the offending municipality is inconvenienced or is suffering, or those adjacent to on the same body of water or farther down on the same river are drinking diluted sewage, the emanation from the offending places.

The degree of dilution which occurred at the time of the installation of a particular system does not remain constant, the number of house connections increase, factory and trade wastes multiply, while the solid portions carried down the sewers accumulate and spread beyond an area at first contemplated. Thus the limit of safe dilution of water when it passes from a potable to a non-potable article is passed without those in control of a particular water supply becoming aware of the fact, only is their attention drawn to the matter by reason of an outbreak of dysentery or perhaps the more serious "Enteric." It is at this point they awake from their lethargy and institute systematic enquiries to find a condition of affairs which is the result of municipal carelessness or indifference. Possibly a private or common sewer has been constructed without appeal either to the local Board of Health or in the later instance to the Provincial Board of Health, or as is too often the case a manufacturing concern assuming powers, which it does not possess, has been for some time discharging its sewage at a point dangerously near the water intake, at first without any appreciable pollution, but by reason of increase in business there has followed an increased sewage effluent, which has resulted in pollution of the municipality's hitherto potable water supply.

In addition to pollutions of this kind we have to consider the pollutions from a large number of factories scattered over the Province which often unhindered, are polluting many of our rivers and lakes. The thousands of farms with their tens of thousands of cattle are adding their quota which is ever increasing in quantity, not to speak of the many houses the owners of which very conveniently run their sewer pipes into the nearby body of water, and thus cheaply get rid of material which should have been disposed of in a different manner.

This is but an outline of the condition of affairs in this Province and with its development along industrial and agricultural lines, and an ever increasing population—these unsanitary conditions will increase, and I cannot too strongly urge upon the Board the need which exists for some power being granted this Board to have a more direct oversight and control of all water systems, together with the streams, lakes and rivers from which the supplies are taken. This power should be such as to permit this Board to direct the prosecution of those offending by polluting the pure waters of our lakes and rivers, be they either corporations, municipalities or individuals, and at the same time the inspection should be periodical of every system—samples being examined by the laboratory whenever deemed necessary, and when a supply is in the opinion of this Board, not safe guarded as it should be, the corporation or owners of the particular system should be required under heavy penalties to make provisions for the protection or purification of the water.

THE INSPECTION AND LICENSING OF DAIRIES, CREAMERIES AND CHEESE FACTORIES.

During the past year an agitation has been going on chiefly amongst those financially interested having for its object the improvement of the sanitary condition of all creameries and cheese factories. Those most interested in the movement would prefer to see some system of sanitary inspection and licensing established by statute.

The movement is a most commendable one, and if successful will do more to establish upon a high standard the quality of two of the products of our Province, which mean perhaps more to the farmer than any other.

The price of butter and cheese depends largely upon the quality and the demand for these is in proportion to the uniform standard of excellence which is maintained by the manufacturer. That one of the important factors in the question is the care paid to the sanitary details of dairy management cannot be denied, hence if any legislation is contemplated it should begin with the dairy, its construction, the care exercised from day to day in the routine of its management from the time the help begins to milk until it is transferred to the creamery or cheese factory must all be considered; the water used for the cattle should be pure as should also that used in washing the cans and other utensils, and the air space in summer and winter of the dairies properly regulated.

As to the factories themselves, they should be properly constructed and kept, while their surroundings should be the cleanest.

For some years provision has been made in the Public Health Act for the inspection of these places, but under the present system of county health officers the law is virtually a dead letter, so it is quite evident but little can be expected if the law remains as at present—local boards of health are as a rule too penurious to pay a medical man for his services, yet, by the way, I might state are often themselves willing to draw $2.00 per day for attending sessions of the Board at which literally no health business is transacted.

I am of the opinion this work could and should be done through the medium of county health officers, and this officer could easily save to the farmers and manufacturers of a dairying county more than his salary annually by reason of the improvement which would follow in the condition of the factories and the improvement in the standard quality of the butter and cheese manufactured.

MUNICIPAL ECONOMICS IN GARBAGE DISPOSAL.

As many of the cities and larger towns are interesting themselves in the disposal of garbage, I submit the few following observations, and outline the system recently adopted in Birmingham, England, the object being to indicate how this municipal bugbear may be turned to a municipal profit, and instead of being a constant eyesore—as a dump generally is, how possibly considerable expense can be saved to a corporation.

In the collection and disposal of garbage, England is certainly in advance of America, and we naturally look to that country for object lessons. Both reduction and incineration have been tried, and to-day there are few if any municipal reduction plants in operation, while there are 143 municipal incinerating plants in successful operation, 120 of which supply, without extra cost, their several municipalities with electric lights or power for their street railways, water works or sewerage systems; while the three principal cities of Scotland and eight large cities of Ireland dispose of their entire refuse by incineration.

In a recent report made by Mr. Joseph G. Branch upon this important subject to the City Council of St. Louis, he states that the average cost per ton for disposal in the English cities is 26 cents, and in only six does it exceed 40 cents. This observer meets the objection that the success in England is no criterion for American cities, by showing the refuse is little different here than elsewhere and gives the composition of refuse as follows:—

	By weight, per cent.	By volume, per cent.
Garbage	13	18
Ashes, (contain 20% of coal	80	57
Rubbish	7	25

and kitchen garbage approximately as

	By weight, per cent.
Animal and vegetable matter	20
Rubbish (cans, rags, etc.)	7
Grease	3
Water	70
	100

And this writer states that it has repeatedly been demonstrated that the waste heat from a 150 ton incremator will develop 1200 h.p. or the equivalent of 895 K. of electric current; smaller incremators in proportion.

In 1901 the Health Commissioner of the City of Birmingham parted with 2 acres of land for the purpose of erecting thereon a ''destructor'' which would convert into electrical energy the caloric derived from the incineration of house and shop refuse, which power would be applied to its own works, dispensing with five energies then in operation and getting rid of gas and water bills, resulting in a net saving of at least $5,000 per annum. These works were opened in November last.

The destructor in use is what is known as the Heenan Patent Top Feed type and cost $23,000. The two engines are of sufficient capacity to consume 60 tons of ordinary house and shop refuse to be burned in 24 hours in one set of 4 furnaces, which is equal to 56 pounds per square foot of grate per hour, each furnace having a grate area of 25 sq. ft.

The makers guarantee that when eight furnaces and two boilers are in use under ordinary onditions the plant will evaporate not less than 9,000 pounds of water when the furnaces are fed at the rate of 8,000 pounds of refuse per hour.

The boiler house, 73x24 ft. provides accommodation for 3 boilers and one economizer. The boilers are constructed to work at a pressure of 160 pounds per sq. in., two are gas fired and one is constructed for coal firing.

The economizer consists of 128 tubes, 9 ft. long, 4 9/16 in. diameter fixed vertically with other mechanical details too numerous to mention in this article.

The electric generating plant consists of two British Thomson Houston, 115 K. W., alternating current electric generators, each of which is coupled to a high speed Bellis & Marconi engine. These generators give an output at 2.250 volts 50 periods, each generator being fitted with a direct connected exciter, so that the unit is self contained. Transformers are provided to reduce from the 2.250 volts to 220, that being the pressure for the lighting circuits.

The electrical energy is transmitted to the sewage disposal works by overhead hard draw copper mill.

Regarding the disposal of the electricity at Saltley—power is supplied to three 2½ h.p. British Thompson Houston motors driving sewage screens, and one 8 h.p. motor for driving power machinery and lightening the offices and house of superintendent at Troutpool. The power is used to lift low level sewage, 835 gallons per minute being raised against a head of 16 feet.

The pumping stations, Bromford, Ashold, and Tyburn, are furnished in like manner; while at Plant's Brook a 10 in. pump raises 2,280 gallons per minute against a head of 17 feet.

Cost.

Building	$86,000
Electrical Work	41,000
Destructor plant and miscellaneous charges	48,000
	$175,000

Cases and Deaths from Contagious Diseases for the Years 1903, 1904 and 1905.

Year 1903 by Months.		Small-pox.		Scarlatina.		Diphtheria.		Measles.		Whooping Cough.		Typhoid or Malaria.		Tuber-culosis.		Total deaths from all causes.	Rate per 1,000 per annum.
	Population reporting.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.		
January........	2,008,300	196	10	500	90	510	59	6	6	9	9	65	25	176	176	2,150	12.8
February.......	1,941,632	153	4	550	104	200	27	9	7	7	7	60	20	163	163	2,176	13.4
March..........	1,917,600	175	1	515	95	228	24	6	2	6	6	60	18	221	221	2,429	14.7
April...........	1,990,231	122	2	295	61	203	28	6	3	19	19	57	16	195	195	2,336	13.4
May	1,973,050	66	2	391	43	205	22	6	4	18	18	48	22	232	232	2,193	13.3
June	1,954,631	30	...	297	52	191	26	26	14	30	20	42	13	175	175	1,848	11.3
July............	1,951,220	29	1	187	26	209	36	5	5	11	11	47	18	139	139	1,873	11.5
August	1,901,021	15	1	103	14	122	24	15	5	12	12	115	32	147	147	1,992	12.5
September......	2,095,666	10	...	100	6	240	30	...	...	11	11	111	37	149	149	2,028	11.6
October	2,081,543	7	...	232	9	541	66	1	1	17	17	178	43	169	169	2,120	12.2
November	2,051,900	5	...	276	9	474	64	5	5	14	14	109	30	137	137	2,081	12.1
December.......	2,059,650	13	...	231	20	474	72	1	1	4	4	120	24	169	169	2,141	12.5
	23,984,844	820	21	3,677	529	3,599	478	86	53	158	148	1,012	298	2,072	2,072	25,267	12.6 per 1000

Average population reporting, 1,998,737=91% of Province.

Year 1904 by Months.		Small-pox.		Scarlatina.		Diphtheria.		Measles.		Whooping Cough.		Typhoid or Malaria.		Tuber-culosis.		Total deaths from all causes.	Rate per 1,000 per annum.
	Population reporting.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.		
January........	2,013,643	103	...	380	24	382	53	32	2	18	7	39	23	179	179	2,200	13.1
February.......	1,924,976	41	1	251	13	289	42	41	1	16	16	18	18	185	185	2,322	14.4
March..........	1,917,081	48	...	234	12	267	48	39	2	6	6	50	18	200	200	2,416	15.1
April...........	1,998,269	33	...	161	10	169	28	98	7	26	7	29	20	219	219	2,290	13.7
May	2,038,083	10	...	128	7	204	29	107	2	4	3	42	32	229	229	2,331	13.7
June	2,030,857	40	1	136	5	257	36	41	1	46	9	40	15	212	196	1,902	11.2
July	1,960,250	13	1	91	9	149	13	15	4	25	8	65	10	185	179	1,861	11.4
August..........	1,941,000	8	...	132	9	172	25	3	1	19	15	293	50	196	188	2,024	12.4
September......	2,012,114	8	1	102	7	164	20	12	3	31	7	182	66	156	145	1,987	11.8
October.........	2,092,300	1	...	177	10	239	34	1	1	20	7	265	63	169	159	2,091	12.0
November	1,900,100	2	...	205	8	316	45	12	1	23	1	171	43	127	127	1,910	12.0
December.......	1,959,643	2	...	165	15	437	65	125	7	45	4	68	39	166	159	2,079	12.7
	23,789,316	309	4	2,165	129	3,045	438	526	32	279	90	1,262	397	2,223	2,165	25,411	12.8 per 1000

Average population, 1,982,443=90% of the Province.

CASES AND DEATHS FROM CONTAGIOUS DISEASES FOR THE YEARS 1903, 1904 AND 1905—*Continued*

Year 1905 by Months.	Population reporting.	Small-pox.		Scarlatina.		Diphtheria.		Measles.		Whooping Cough.		Typhoid or Malaria.		Tuber-culosis.		Total deaths from all causes.	Rate per 1,000 per annum.
		Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.		
January	2,019,590	10	...	223	12	412	67	268	4	27	4	69	21	174	169	2,216	13.1
February	1,935,897	8	...	209	16	270	35	119	2	22	3	43	19	177	165	2,263	14.0
March	1,946,271	16	...	168	8	223	27	154	5	54	5	30	16	208	200	2,417	14.9
April	1,903,402	70	2	157	7	212	27	494	27	45	4	37	10	211	198	2,164	13.6
May	1,980,887	35	...	89	6	220	31	880	1	89	97	31	18	204	200	2,148	13.1
June	2,059,515	19	...	96	5	212	40	420	11	40	8	43	19	210	207	1,933	11.5
July	1,959,311	8	...	52	2	128	12	90	3	80	21	89	19	166	144	1,871	11.4
August	1,990,065	8	1	30	2	132	21	26	4	141	16	256	43	153	147	2,200	13.2
September	2,010,100	14	2	27	1	143	20	32	1	97	14	278	45	153	152	2,128	12.1
October	1,984,157	63	...	96	1	191	29	25	1	36	6	350	48	170	163	2,047	12.3
November	2,010,532	183	...	122	5	267	30	28	3	85	11	210	55	134	134	2,080	12.4
December	1,959,700	123	...	151	5	231	28	40	2	35	6	307	48	172	172	2,116	12.9
	23,759,427	547	5	1,420	70	2,641	367	2,576	64	751	106	1,743	361	2,232	2,051	25,583	12.8 per 1000

Average population reporting, 1,979,952=90%.

Municipalities Having Highest Number of Cases and Deaths of Typhoid Fever for Year 1905.

Cities, Towns and Villages.	Cases.	Deaths.	Cities, Towns and Villages.	Cases.	Deaths.
Toronto	197	40	Brockville	7	1
Pembroke	64	8	Bracebridge	7	1
Port Arthur	100	4	Cobden	7	1
London	63	10	Ingersoll	6	....
Parry Sound	59	4	Tillsonburg	6	1
Copper Cliff	51	8	Deseronto	5	1
St. Catharines	40	2	Ottawa	4	4
Brantford	39	2	Lindsay	4	1
Hamilton	42	9	Mount Forest	4	....
Rainy River	37	1	Bosanquet	13	...
Fort William	85	6	Onieda	10	....
Owen Sound	27	2	N. Walsingham	9	2
Sarnia	31	....	Osnabruck	8	....
Guelph	23	2	Wallace	8	3
North Bay	26	14	Cramahe	6	....
Toronto Junction	19	....	Harley	5	....
Kenora	14	1	Tuckersmith	5	....
Kingston	13	3	Rochester	5	....
Woodstock	11	3	*Gosford, N.	6	. .
New Liskeard	10	8	Hallam	4	....
"Soo"	9	3	Humphrey	4	2
Uxbridge	9	....	Sheffield	4	....
Galt	8	....	Carrick	4	....
Hespeler	8	...			

* For December alone.

Medical Inspector's Reports.

By R. W. BELL, M.D.

Presented at the Quarterly Meeting held February 1st, 1906.

Report on Prosecutions and Hospital Accommodation at Cobalt.

In accordance with instructions received at your Board meeting in October last, *re* prosecution of mine owners who refused to obey the Sanitary Regulations in Unorganized Districts, I visited Cobalt, in the Temiskaming District, during the first week of December, and again interviewed Mr. Wells, Manager of the Buffalo Mining Co., who had in September positively refused to comply with the Regulations. He was still of the same mind, and declined to make contract for medical attendance on his employees. I therefore laid an information before Magistrate Hartman of New Liskeard, charging him with "Neglect and refusal to contract (under clause 12) with one or more qualified medical practitioners for the medical and sanitary supervision of his employees and works." He appeared in court and offered no defence, except that he thought it an unjust law. The Magistrate fined him ten dollars and costs—four 75/100 dollars, in all fourteen 75/100 dollars, and warned him to obey the law, or a much heavier fine would be imposed if again brought up.

The following day he entered into a contract with Dr. Young of New Liskeard, for the required medical attendance.

I might here add, that the required hospital accommodation is not furnished by any of the mine owners at Cobalt, or their mines, and that the reported contracts in regard thereto are not being carried out. Both Drs. Field and Young of New Liskeard, (whose representatives at Cobalt in September, stated they were providing hospital, nursing and board for the medical fee of 50c. per month per man contracted for), now state that they are not furnishing these requirements for this fee. Such being the case the mine owners will have to pay the fees in accordance with the Act, if they continue to utilize the accommodation at New Liskeard, which however, is too far away from most of them, and as your Secretary wrote in a circular letter to each of them on September 23rd, "is clearly not in the interests of your employees, nor in compliance with the Act." He also wrote, "kindly let me know by return mail the name and address of the physician with whom you have contracted (clause 12), also what provision you have made for hospital accommodation for the men in your camp (clause 4)." Only nine replies were received, two saying they had contracted for hospital with the Doctor—two can provide at their camps, and the others have none or ignore that part of the request.

In September I suggested on your behalf to a meeting of mine owners, that a Union hospital at Cobalt would be acceptable to your Board, but no action has been taken, therefore I see no other course to pursue, but to insist on a strict enforcement of the Regulations requiring hospital provision at each camp, and prosecution if neglected.

December, 23rd, 1905.

Report on Typhoid Fever at Pembroke and other Places.

While on a tour of inspection recently in Northern Ontario, several outbreaks of typhoid fever were brought to my notice which I think well to speak of.

First, in Pembroke I was informed by several physicians that there had been many cases during the past Fall, and that there appeared to be great indifference shown regarding the matter by the health authorities, and but little action taken towards removing the cause.

Dr. Sparling, M.H.O., could not give any data as to the number of cases, as they are not reported to him, but the number was unusually large, causing much comment amongst the medical fraternity. All were apparently agreed, that the water supply was the cause of the trouble. The town supply is pumped from the Ottawa River in front of the town, to an elevated tank, and from there distributed by gravitation for all purposes. Samples of water were analyzed a year or two ago from the river, but not since. However, recently the sediment deposited in the bottom of the tank was examined, and colon bacilli were found. The tank was then cleaned out, but no other steps taken to remedy the matter.

The Ottawa River here runs in an easterly direction, and is very wide, the main channel and current being on the opposite side near Allumette Island, while the town is situated on a bay which is almost dead water, or having an eddy westward and up stream, unless when a westerly wind blowing. The pump house is situated in the western end of the town, and from it the intake pipe runs out and down the stream about 400 or 500 yards, to pretty near the old wharf, and into about twenty feet of water, but no current.

The main town sewer empties into the bay a few hundred yards east of the intake and only a few yards above the mouth of Muskrat River, which also has several sewers emptying into it. The bay is very shallow, and with the eddy running westerly and frequently increased by easterly wind, the whole volume of sewage is likely to be carried towards the intake pipe. A diver examining the mouth of the intake, says the eddy is right up to it at the bottom and there is a deposit of at east two feet of sediment about the pipe, which is elbowed up three or four feet. One medical gentleman informed me, that he had sailed through an acre of floating fecal matter and paper, etc., from closets, in the bay between the sewer and the intake.

Dr. Sparling is anxious to have the intake extended out into the current. He reports that most citizens having become alarmed, are boiling the water for domestic use, and the epidemic has subsided to a great extent. In the meantime I advised further analysis of the water, taken from various points, also from several wells in the town, and from the wells of all milk men where cans are washed, etc., to find out if there is any other source of infection besides the town system. A further report will probably be received from the local M.H.O.

Second. On the line of the T. & N. O. Ry. north of New Liskeard, there had also been a number of cases of typhoid, about 40 or 50, in the railway construction camps of 1,200 to 1,500 men, during the Fall, but at the time of my visit the epidemic was virtually at an end. There had been about five deaths from it, but the trouble was well kept in hand by three doctors who were constantly employed along the line under Dr. Field of New Liskeard, and who, I have every reason to believe, furnished every comfort possible, and gave the closest attention to those down with the disease in the hospitals.

From this epidemic no doubt arose a number of exaggerated statements, and several falsehoods, on which were founded complaints made to your Board by a citizen of New Liskeard. These I investigated while there in the first week of December, and fortunately two of the physicians from up the line being in town, we had an interview with the complainant, and he expressed himself as satisfied that he had been misinformed, and the complaints were without foundation. Contaminated water supply is supposed to have been the source of the disease, and the necessary steps were taken to remedy the cause, and soon there was a steady decrease in the number of cases.

Third. At Sault Ste. Marie on Dec. 10th, Dr. J. D. McLean asked me to visit the Algoma Indian Home (Shingwauk), situated in the eastern end of the town, where there was a recent outbreak of typhoid fever, there being twelve cases at the time of my visit, and there had been one death a few days previous. The Home is an industrial school, with from 60 to 80 Indian children, supported by the Anglican Church. It is well situated close to the St. Mary River, from which it derives its water supply. Dr. McLean fears the water is contaminated from the town sewage, which is probably the case, and this source of danger is going to increase with the growth of the town. The water is pumped up to tanks in the upper story of the building. One of these had been recently thoroughly cleansed and the other was to be attended to immediately. All water for domestic use was being boiled, and it was hoped the epidemic would be under control in a few days.

The sewage of the institution was discharged into cess-pools, which were not likely to contaminate the present supply. However, as the river supply is likely to be rendered continuously impure, because of the town sewage, I would suggest the boring of one or more artesian wells for a local supply, as the institution is too far away at present to get connections with the town system, and then have the institution sewage carried to the river a little further down. These changes seem almost imperative in the sanitary interests of the Home.

December 27th, 1905.

Resolution of Board *re* the Outbreak of Enteric Fever in Pembroke.

Moved by Dr. Boucher, seconded by Dr. Thompson and carried, The Provincial Board of Health having heard the report of Dr. R. W. Bell, Medical Inspector, *re* the outbreak of Enteric Fever in Pembroke, and learned of the unsanitary conditions, particularly the location of the intake pipe, in respect to the sewer outlets, and also the possibility of pollution being carried toward the water intake by the Muskrat River into which the sewage is permitted to run, desires, in view of these facts, to express the opinion that the municipal council should, in the best interests of the public health, take steps to secure for the citizens of Pembroke a potable water supply, and would require the council to forthwith take steps to provide the same.

Further, this Board requires the council to provide for the immediate installation of a disposal plant with the discontinuance of pouring raw sewage into either the Ottawa River or Muskrat River, and all plans and specifications connected therewith be submitted to this Board at the earliest possible date.

Report on Lumber and other Camps in New Ontario.

I have just returned from a tour of inspection extending over four weeks' time and two thousand miles travel, chiefly amongst the lumbermen and mine owners operating in the unorganized districts of Northern Ontario. During this period I have been in touch with over eighty lumber firms, having over two hundred and fifty camps in operation, and employing more than seventeen thousand men in their woods department.

These are all between the Ottawa Valley on the east, and the "Soo" or Biscotasing on the west; those further west in the Lake Superior and Lake of the Woods region, not having yet been visited this season.

The season's work is far advanced with the lumbermen, as operations are beginning earlier in the woods each year, many getting to work in August and some even in July, so that most of the cutting is done by the end of the year, before the time of deep snow, and many men discharged, as only the hauling remains to be done.

So far the camps have been unusually free from accidents or sickness, and such being the case, many of the employees do not realize the necessity for having a physician regularly engaged for attendance upon them, and object to the deduction from their wages of a small monthly fee, to meet this requirement.

In a number of cases, particularly in the eastern portion of the Province, the monthly fee has been abolished, and the physician is paid by the employer, the reason assigned therefor being, that in the early part of the season when men are scarce, they are very independent and refuse to hire with those who deduct the fee. However, I fear in many cases the medical inspections and attention required for the camp is not furnished, and the physician is only paid a stated amount for each visit to the camp, as requested to be made by the employer.

Further west, however, the monthly fee is deducted in most cases, and there is no difficulty in getting men because of it; in fact several of the employers told me that men objected to going into the woods unless a doctor was employed for the camp, and they were quite willing to pay the monthly fee. The further west the higher the fee charged, and the less grumbling because of it. In the region of Lake of the Woods, one dollar per month is paid by each man for the medical fee; about Fort William and Port Arthur seventy-five cents in most cases; in the Blind River camps near the Soo, sixty cents is the fee; but east of there and about Sudbury, the minimum fee of fifty cents is charged, and I find even for this sum in many cases, the physician also agrees to supply hospital accommodation and nursing, etc. In these cases the hospital accommodation is not furnished in camp, but the patients are brought out to the town where the doctor resides, and placed in a hospital if there is one, as at Sudbury, North Bay, Mattawa, etc., and it is claimed the patient has closer attention from the doctor who can see him daily if necessary, and has professional nursing, etc. There is an element of truth in this assertion, but of course it is distinctly understood that this cannot apply to infectious or contagious diseases which must be isolated and quarantined where they develop. Because of this arrangement with some of the contract physicians, hospital accommodation is lacking in many camps, although in almost every case a building can be appropriated for isolation purposes if required, immediately. In several of the larger camps, however, there is a good hospital furnished, and a resident physician employed. Wherever there is a group of camps reasonably close together, belonging to one or more "concerns," I have always recommended the employment of a resident physician in camp, with a central or union hospital.

The sanitary regulations about the camps are as a rule very well carried out, that is in regard to size and location of buildings, together with ventilation, cleanliness, drainage and non-pollution of water supply.

The clause in the Regulations requiring vaccination of all employees before going into camp is practically a dead letter, and the employers say positively cannot be enforced, unless when an epidemic of smallpox breaks out, as the men will not submit to it, and they will either decline to hire, or leave camp if it is suggested. The physicians attending the camps confirm this statement. If prosecution is to result for non-compliance with this regulation, then every employer of labor in the Unorganized Districts will be liable.

Prosecutions, however, may be necessary in a few instances, for either refusal or neglect to comply with Clause 12 of the Regulations, requiring a contract with one or more physicians for attending on the camps and employees. Refusals are few, but several while promising to immediately conform to the requirements of the Act, as soon as I have gone, neglect to do so, and when written to for information, ignore the request and do not answer. These are worse than those who set us at defiance without reserve, as it takes time to find them out, and many of them are very plausible, and only try to gain time to escape carrying out what might cost a few dollars if they obeyed our laws. A more detailed statement has been handed to your Secretary regarding these parties, in the shape of a "memo."

I would suggest the drafting of a model contract between employer and physician, copies to be furnished to all employers of labor or contracting physicians, also that a copy of the contract, whether on this form or not, be sent to your Secretary not later than October 1st in each year, or if camp not formed until later, then within one month of its commencement of operations, the non-receipt of which is to be taken as evidence of non-compliance with the Regulations, and the offending party be at once proceeded against.

I further suggest that a detailed descriptive report, with sketch of each camp contracted for, be required from the contracting physician, immediately after his first monthly visit.

December 30th, 1905.

Report on Smallpox in Chandos, Lindsay, and Mariposa.

Although smallpox has been very prevalent in several sections of the Province during the past three months, the Unorganized Districts have been almost entirely free from it, not requiring any visits on account of it from me.

At the urgent request of the local authorities and by direction of your Secretary, I visited two outbreaks in Central Ontario, one being in the northern part of the counties of Hastings and Peterborough, and the other in the Town of Lindsay and adjoining townships of Fenelon and Mariposa. In the former section I visited the townships of Wollaston and Chandos, on November 1st and 2nd, and there found twenty-eight cases, mostly in the eastern side of Chandos. The disease had been rampant for three or four weeks, before being recognized, and is said to have been diagnosed as "ivy poisoning" by an unlicensed practitioner whose services had been called in to several cases. As soon as properly diagnosed, active measures were taken to stamp it out by the Local Boards of Health, and the Medical Health Officers, Doctors Driscoll, of Coe Hill, and Bell, of Apsley.

Vaccination had been carried on vigorously, and quarantine regulations were being enforced even to the extent of constables doing "sentry go" on the concession lines, armed with rifles. Churches, schools and cheese factories had been closed and all public meetings prohibited. The disease had been traced to the Township of Faraday, where it had been prevalent shortly before, as reported on by me at your October meeting.

Unfortunately one suspect left his quarantine in Chandos, and carried the disease to his family near Oak Lake, in Township of Methuen, where it spread to several families before being stamped out. Here, Dr. Holdcroft of Havelock attacked it vigorously and succeeded in checking it. In Chandos, however, a number more cases developed before it was completely in subjection, but our latest reports are that it is controlled and about at an end. Of the twenty-eight cases existent at the time of my visit, I was informed by Dr. Bell, that twenty-seven had never been vaccinated. Several had been of the confluent type, while others had been of the modified form.

The following week—on November 7th—I visited the Town of Lindsay, and there found a well-marked case in the crust stage in the Isolation Hospital.

This man had been arrested as a vagrant on 1st inst. and sentenced to six months in the Central Prison. While awaiting transport in the gaol, Dr. Jeffers, Gaol Surgeon, recognized smallpox, and at once had him removed to the pest-house. As he had spent a night in the police cells, and had also been in the Court-room, these places, as well as the Gaol, had been disinfected by Dr. McAlpine, M.H.O., and several exposed persons quarantined.

Lindsay has been fortunate in having such an efficient M. H. O. as Dr. McAlpine, as this is the third time within a few months that smallpox has appeared in the town and always imported from outside, but it has been corralled immediately, and the further spread prevented, through the energetic efforts of the M. H. O., backed up by the Local Board of Health. The present patient told me that in the early stage of his rash, he had travelled by train to Wahnapitae, intending to go into a lumber camp, but on arrival there, some one suspecting his disease, had ordered him to leave immediately, and he had within a few hours returned to this neighborhood, doubtless spreading the disease, but just where he had been I could not learn, as he replied on enquiry, "just around among the farmers." In the adjoining Townships of Fenelon and Mariposa, I traced up fourteen cases, and saw several of them, in the neighborhood of Cambray and Oakwood. One case particularly, was the confluent type, while two others in the same house were of a modified form. Here the disease had remained unrecognized for two or three weeks and had spread to several families, owing to non-recognition on the part of a Medical Man, who had never seen before a case of smallpox, and again I believe a debt of gratitude is due to Dr. McAlpine for timely assistance in identifying the disease. Measures however were being taken to stamp it out, which, I understand, have proved effectual.

The great preventative, vaccination, is astonishingly overlooked frequently by the attending physician, while he is taking effective measures to isolate the patient and quarantine all suspects or exposed persons. I have in mind as I write, a case of a rural physician, who, suspecting a case of smallpox in a young girl patient, ordered quarantine on the house and reported the case to the M. H. O. He neglected to vaccinate any of the family, although there were five other children in the house besides the patient, none of whom had ever been vaccinated. Fortunately, a few days showed he was wrong in his diagnosis, and the case was not smallpox, but his neglect was none the less inexcusable. This is not an isolated instance of neglect. I know of others. Unless more effective measures are taken to enforce vaccination, we are going to have a steady increase in our number of cases. I am constantly urging on the M. H. O.'s and Boards of Health, the expediency of vaccination, and the necessity for enforcing it in the schools, but there is frequently great reluctance to adopting legal methods to carry out what they know to be best and what they have power to enforce.

December 30th, 1905.

Reports of Committees.

Report of the Committee on Sewage and Water Supply (West) on the Palmerston Water Works.

To the Chairman and Members of the Provincial Board of Health:

GENTLEMEN,—Your Committee on Sewage and Water Supply (West) having considered the plans for supplying water to the Town of Palmerston (Ont.), submitted by John Galt, Esq., Consulting Engineer, and it having been stated in a circular accompanying the plans that an analysis of the water from one of the tube wells, which is at present in use, has been made by Dr. Amyot and has proved satisfactory, would recommend that if on analysis by the bacteriologist of this Board the other tube wells should prove to be satisfactory that the application of the Town of Palmertson be granted, provided that the tops of the wells are guarded.

All of which is respectfully submitted.

(Signed) J. J. CASSIDY,
ALEX. THOMPSON,
Toronto, January 31st, 1906. CHAS. A. HODGETTS.

Report of the Committee on Sewage and Water Supply (West) on the Proposed System of Sewers for the Town of Fort William (Ont.)

To the Chairman and Members of the Provincial Board of Health:

GENTLEMEN,—Your Committee on Sewage and Water Supply (West) having read the report on the drainage system for Fort William, submitted to the Mayor and Council of Fort William by John Galt, Esq., Consulting Engineer, and having studied the plan of sewerage submitted to him, are of the opinion that septic tanks should be used at the twelve outfalls of the sewers, which appear in the plan, so that only clarified effluents from these sewers would empty into the rivers.

Should at any time any just cause of complaint be made as to the fouling of these rivers by the sewage of Fort William, it must be the duty of the Town Council of Fort William to take suitable means to secure satisfactory effluents from the sewers before they discharge into the rivers.

All of which is respectfully submitted,

(Signed) J. J. CASSIDY
ALEX. THOMPSON,
Toronto, January 31st, 1906. CHAS. A. HODGETTS.

Report on Drainage System for Fort William.

By JOHN GALT, C.E. & M.E., Consulting Engineer.

Drainage.

The Mayor and Council, Fort William :—

Gentlemen : —

Combined System.—I have now studied the problem of drainage for Fort William and find that a complete system can be designed and constructed to carry off all surface, cellar and house drainage by natural gravitation to the Kaministiqua and Neebing Rivers.

Present Sewers.—In working out this problem, I found it absolutely necessary to disregard largely the attempts which had been made some years ago by the construction of your present system.

Low Land.—The northeast part of the town is the only section which presents more than the ordinary difficulties. Here the case is a very special one and requires special means for its satisfactory solution.

The general elevation of the ground to the north of Victoria and easterly along Simpson St., including the district east of the main line of the C.P.R., is rather too low to be of much value and importance unless raised to a suitable height to permit of proper cellar drainage.

The ground elevation falls to the north and east towards the river outlets where it is only about a couple of feet more or less above the lake level.

I find that this area should have a falling gradient from the natural elevation on Victoria St., to about five feet above lake level at the banks of both rivers. By establishing this, complete natural drainage and sanitary conditions can be secured by special means, which will gradually but ultimately make it a most valuable district.

This, of course, means time and money to gradually raise the present natural grade from one foot to about three feet in some places. This would correspond closely to the elevation of the rail level on the main line of the C.P.R.

Numerous Outlets.—The draining of this area of all surface and cellar water, including house waste, by natural fall to both rivers, will require numerous outfalls of special design and construction laid to flat gradients, running from each district to the Kaministiqua or Neebing River, as the case may be.

Special Design of Drain.—The area served by each outlet main is, of course, small owing to the fact that the lateral branches can only extend a very limited distance, and in many cases these will have also to be built of special design and cross section so that they will equally suit the minimum dry weather flow as well as storm water, which the ordinary circular sewer pipe could not do under the circumstances.

In addition to all this, special provision will have to be made for cleansing, flushing, ventilating, etc.

The cross section to be employed, while somewhat similar to the egg-shaped sewer, will be much better, being simpler and cheaper in construction and much more efficient in service because it will not be arched over, but built up of concrete from a plain flat bottom with almost vertical sides, and tapering straight inside from a small radius of invert to a large expanding width at top and height to suit this combined service.

This style of channel which will form the various outlets, mains and principal tributaries, will be deeper than usual and large enough to secure the maximum velocity and discharge with the least fall. The top of these outlets will always be well above the hydraulic gradient along its entire length, including its entry into the river, which will give a free discharge and prevent them from being sewers of deposit as far as possible.

The top of this specially designed sewer will be covered over with flat plain concrete slabs six feet long, more or less, strong enough to carry the superincumbent weight of dead and live loads on roadways, although in some cases some slight metallic reinforcing may be found necessary on the larger sizes. The bottom, including the invert and the two sides, will be built up in one continuous piece of a plain and strong design to give a good foundation and resist tendency to collapse.

House Connections.—The connections from cellars and houses, including street gullies, can be easily made and will enter about high water mark.

The accompanying plan illustrates fully this new style of sewer, which I have designed to meet some of the difficulties of your drainage problem, more especially in the low lying northeastern areas, and so avoid a costly pumping system which in any event would be only utilized for cellar and house sewage.

Manholes.—Provision will be made at manholes for ventilating, cleaning and flushing, and the system generally made quite handy for inspection and handling. Am also relying upon the liberal use of water carriage and frequent flushing, after an abundant supply is obtained from Loch Lomond.

Drainage District.—The accompanying plan shows very closely the boundaries of the various districts drained by their respective and separate outlets, twelve of these for the present being located and numbered to correspond accordingly with the outlets.

Low Level District.—The Districts Nos. 5, 6 and 7, with outlets to the Kaministiqua River, and Nos. 10, 11 and 12, with outlets to the Neebing River, in all about 400 acres, are the specially low flat areas requiring special care and design in order to secure natural fall for the free discharge of surface and cellar drainage.

These outlets must be brought in from both rivers on very flat gradients by means of specially constructed channels, from which main tributaries will run, and lateral branches for short distances only.

To enable this to be done properly, it will be absolutely necessary to have the general grade raised on an average about two feet, some portions requiring three feet and others only one foot.

Districts 5, 6 and 7.—District No. 5 of about 50 acres, can best be drained by outlet across from Dease St., while No. 6 and 7 can be drained from McTavish and Bain Streets.

Districts 10, 11 and 12.—The outlet No. 10 on May St. can easily take drainage from property on both sides as far up as Cumming St., and No. 11 on Prince Arthur Boulevard can be designed to drain a considerable portion to the east, while No. 12 outlet channel from the Neebing, along Simpson St., with branch mains, can be utilized for that section.

Business and Central District No. 4.—No. 4 outlet and district which is the central and most business section adjacent to Victoria and Simpson Sts., should be re-arranged and made to discharge via Stewart St., so that good fall can be got on Victoria St., from Archibald or John St., and also on Simpson St., from Bethune. The area of this important district is not large and my investigation leads me to think that until this Victoria St. sewer is revised and reconstructed, good results will never be obtained. Apart from the irregular and defective grades, the main along a portion of Victoria St. seems larger than is required for storm water, and, being of circular form, makes it unsuitable and unsanitary for minimum dry weather flow.

District No. 8.—District No. 8 is, of course, now under construction and can be made to drain from Arthur St. to the Neebing River.

District No. 3.—District No. 3 can be nicely drained by outlet to the Kaministiqua from Ridgeway, and so can No. 2 by outlet either on Duncan or Garnet Streets.

Large District No. 1.—The large District No. 1 to the west as shown on plan, can all be drained by one outlet to the Kaministiqua from Christana, or it could be divided in two by the construction of an intercepting main on Tarbutt St., or Ford St., with outlet to the Kaministiqua River, but in view of drainage on West Fort being demanded sooner, then Pump House could probably be abandoned. I think the best and cheapest plan is to discharge as shown.

The territory to the north of this No. 1 District can all be effectively drained to the Neebing River.

Drainage Areas.—The drainage areas are as follows:—

No. 1	800	Acres.
" 2	200	"
" 3	120	"
" 4	85	"
" 5	55	"
" 6	40	"
" 7	40	"
" 8	105	"
" 9	80	"
" 10	75	"
" 11	75	"
" 12	130	"
Total	1,805	Acres.

Difficulties of Design and Construction.—The problem of drainage, especially in the low lying districts, is after all not an impossible task, but it will have to be done with the utmost care and skill, not alone because of the engineering difficulties, but because of the difficulties likely to be encountered during construction in a wet and treacherous soil.

Sewer Piping.—I do not think that ordinary vitrified clay sewer pipe should be used above twelve inches in the low districts and above eighteen inches in No. 1 district, and if ever used at all the thickness and strength must be much greater than was the case in the twenty-four inch main which was laid on Miles St., and afterwards collapsed.

The design of manholes and street catch water basins will have to be very different from those in use.

It may be advisable in after years to modify these outlet channels and construct them similar to a septic tank, so that nothing but clear liquid would empty into the rivers.

I hope I have succeeded in explaining to you in a simple and practical way the more important features of this drainage problem, and on hearing from you at any time, shall be only too pleased to prepare the necessary profiles and working details, etc., for purposes of construction and the establishing of permanent street grades.

Yours respectfully,

John Galt,
Consulting Engineer.

Report of the Committee on Sewage and Water Supply (West), on the Plan of Supply of Water for Fort William (Ont.)

To the Chairman and Members of the Provincial Board of Health:

Gentlemen,—Your Committee on Sewage and Water Supply (West), having seen the plan and photographs of the proposed water supply of Fort William from Loch Lomond, a lake in the vicinity of that town, and having been informed by the bacteriologist, Dr. Amyot, that an analysis of the water of Loch Lomond proves it to be of exceptional purity, would recommend that this source of supply be approved.

Your Committee would further recommend that the source of supply (Loch Lomond) be protected from pollution.

All of which is respectfully submitted,

Signed,

J. J. Cassidy,
Alex. Thompson,
Chas. A. Hodgetts.

Toronto, February, 1906.

Report on Gravitation Water Supply from Loch Lomond.

By JOHN GALT, C.E. & M.E., Consulting Engineer.

Loch Lomond Water Supply.

Toronto, June 24th, 1905.

To the Chairman and Members,
Water Commission,
Fort William, Ont.

Gentlemen,—

General.—In compliance with your request, I made careful surveys and examination into the project of bringing a water supply from Loch Lomond by natural gravitation into the Town of Fort William, and am now pleased to be able to report that the result of my inquiry and study of the problem is most satisfactory in every respect, both from an engineering and sanitary standpoint; and as the total cost should not run over $220,000, it would appeal to me to be also satisfactory from a financial standpoint.

Elevation.—I find that Loch Lomond is situated about six miles from the town at an elevation of 333 feet above the Kiministikwia River, and is a beautiful body of clear pure soft water, free from all contamination, and a delightful water for all general and domestic purposes.

Quality.—In proof of this, would advise a visit to the Loch and a perusal of the following report on the chemical analysis made by Dr. Amyot, the Provincial Government Bacteriologist and Chemist, from four different samples collected by myself on the 25th of May last.

TORONTO, June 1st, 1905.

Report on waters received from Dr. Birdsall, of Fort William, on May 30th, 1905. Analysis were begun on same day.

Laboratory	Senders	Where collected from	Streptococci	Staphylococci	Colon Bacilli	Colonoid Bacilli	Chlorine in parts per Million
1487	1 42	Loch Lomond 50ft. out 5ft. down	None	None	None	None	1
1488	2 36 L	" " 100ft. out 10ft. down	None	None	None	None	1
1489	3 X37	" " 150ft. out 15ft. down	None	None	None	None	1
·1490	4 4	" " 400ft. out 20ft. down	None	None	None	None	1

These waters do not show chemical pollution, nor are they infected with harmful bacteria.

(Sgd.) JOHN A. AMYOT.

Size and Depth.—The Loch itself appears to be an area of about ten square miles and varies in depth, some places being about 200 feet deep. It is formed by a portion of an abrupt deep basin, which includes a drainage area of about fifty square miles, and is fed by numerous creeks, which carry the greatest portion of the rainfall to it, this, of course, being its primary source of supply.

Location.—It is beautifully situated on a plateau contained on a range of high hills to the southwest of the town; the most important summit of which is known as Mount MacKay, at an elevation of about 1,000 feet above the town, and contiguous to the corporation limits.

Carp River Outlet.—The shore line of the Loch in many places rises very abrupt and is indented with numerous inlets and bays forming promontories. One of these inlets reaches to the Carp River outlet, which forms the overflow to Thunder Bay.

Quantity.—Not only is the water perfect from a sanitary standpoint, but the supply is abundant and without doubt ample for a popluation of one-quarter of a million people, therefore is largely in excess of what is likely to be required for many years, even if your sister town of Port Arthur should desire to utilize this source also.

Taking into account the geological and topographical character of the drainage area, it is pretty safe to assume that one-half of the total annual precipitation of rain and snow can be got from say forty square miles.

Rainfall.—The total yearly supply of water should average, therefore, about 10,000,000,000 gallons, or say 25,000,000 gallons per day, taking fifteen inches as available rainfall. This is a satisfactory showing and proves most conclusively that the surplus and factor of safety between supply and demand for many years to come is very great. Some years, of course, will give greater supply and some perhaps less, but on the whole, the above appears to be an absolutely safe foundation to build upon.

Flow.—An important element in the problem is the minimum daily flow. Now, it is quite possible that as the years roll on and population largely increases, this may become less than the maximum daily demand, in which case the storage supply of the Loch would be drawn upon to make up the deficiency.

At present, however, and for some years to come, this storage will not be required because the minimum flow during long dry periods will likely be as great as the maximum requirements.

Storage.—To accurately determine the question of amount of storage required, it would be necessary to know the daily yield of the stream in years of minimum flow, and then find the deficit of each day when the flow fell below the daily consumption. The sum of these several deficits would be the amount of storage required.

It is very rare that an opportunity is afforded to gather such exhaustive data, and the engineer is generally obliged to content himself with a safe approximation gained from experience.

The two limits are:

1. The case where the minimum flow is equal to the maximum daily consumption, when no storage at all is required.

2. When the total yearly flow is just equal to the total yearly demand, then the maximum of storage is required.

Compensation.—In this latter case, the storage capacity should be arranged to prevent even a drop of water from being wasted at the overflow. The water level will fluctuate, but the storage capacity will compensate for the inequality of supply and demand during each day of the year.

Hence as a general rule, the nearer the yearly consumption approaches the total yearly flow of the stream, the greater must be the storage and vice versa. In the case of Loch Lomond, the vast storage is spread out over a large area of about ten square miles, thus giving the necessary capacity for compensating storage in three feet depth of water, which permits of the entire annual yield at the rate of 25,000,000 gallons per day to be utilized if required.

This latter deduction is important in establishing the highest level of invert of tunnel at the Loch, and if bottom of tunnel inlet was placed at six or seven feet below the overflow level at the Carp River, this depth would represent an entire year's supply at the rate of 25,000,000 gallons per day, without the addition of the yearly supply which is received from the watershed. So that the great value and importance of Loch Lomond as a safe and perfect source of supply is quite apparent.

Variable Flow.—When visiting the Loch on May 24th last with Mr. Wells, the Chairman, and my Assistant Engineer, Mr. Evans, I found the overflow at Carp River Dam by actual measurement, equal to about 40,000,000 gallons per day, but Mr. Evans informs me it was overflowing during the first week of April at the rate of only 55,000,000 gallons per day. At this time the ice was still firm, and water had not begun to rise. Since that date, however, and before he had completed his surveys during May, the ice had gone, water level had risen and by actual measurements the overflow had reached a rate of about 60,000,000 gallons daily, showing conclusively that the facts before stated, including the gauging of stream, more than confirm the foregoing deductions which I have made, viz., that Loch Lomond is an absolutely safe source of supply for a population of at least a quarter of a million.

Limitation to Supply.—I have taken pains to fully explain this storage feature of the scheme, not because it is of consequence for present requirement, but because it is an important feature in the limitations to the permanent design and solution of the water supply problem for your district for many generations to come, and besides is justification for the necessary expenditure required to be made.

I will now explain the necessary engineering features of proposed design and construction:—

Design.—The bottom of the open rock cut at the Loch end shoud be about eight feet below the normal level of water in the Loch when just about to overflow at the Carp River outlet. This normal level I take to be about 333 feet above the ordinary level of the Kaministikwia River, so that deducting eight feet, the bottom of rock cutting and also the tunnel at the Loch end will be at an elevation of 325.

Inlet.—The open cut will be continued out into the Loch with a slight descent, and a concrete bulkhead formed some distance back from the shore line, from which a submerged inlet pipe three feet in diameter will run out upon the natural bed of the Loch a sufficient distance, say to a depth of about thirty feet more or less.

This bulkhead will also be designed to act as a screen chamber and gate house for controlling the inlet of water to tunnel by means of sluice valves.

Tunnel.—This tunnel will pass through solid rock on a falling gradient of about one in a thousand, a distance of about practically 5,000 lineal feet and emerge on the other side of the hill facing northeast towards the town and 21,500 feet from the Kaministikwia River.

Supply Main.—The elevation of the bottom of tunnel at this end will therefore be 320 feet above the river, and shall deliver into a small basin or bulkhead, to which will be attached two twenty-four inch cast iron outlet pipes with stop valves and blow offs. From one of these twenty-four inch pipes, I propose attaching one sixteen inch wooden supply main 9,500 lineal feet to a point at the end of the plateau, which has a natural ground elevation of 200 feet above the river and overlooks the Indian Reserve Mission Flats.

Service Main.—At this point, I would erect a large steel storage reservoir thirty feet in diameter by ninety feet high, to maintain and hold in reserve for compensating storage supply purposes, one-half millions gallons of water. From this point on to the town, I would lay one eighteen inch cast iron supply main 12,000 feet in length to the Kaministikwia River, and then lay duplicate special eighteen inch mains across the river; the arrangement to include the necessary connections and stop valves, also relief and regulating devices, etc.

Plans.—The accompanying plans and profiles will explain and show exactly all that I have described in the foregoing.

Compensating Storage Supply.—The object in placing a compensating storage supply on the edge of the plateau and at a point about half way between the town and Loch Lomond, is to simplify and render more safe and efficient in operation the entire system of gravitation.

Efficiency.—It not only enables me to reduce the main from tunnel to storage tank to a size capable of easily and constantly delivering the average amount of water required during each twenty-four hours, but permits of maintaining uniformity of pressure and high service efficiency notwithstanding the minimum and maximum demands for domestic supply and fire service which may be required at any moment of the day.

Safety and Economy.—The advantage of having the water supply in case of maximum fire service, drawn from a nearby storage, is of considerable importance and value because to take it from the lake or even from a compensating storage basin which would have to be constructed at tunnel mouth, would certainly mean loss of efficiency and pressure in town unless the supply main was made larger all the way throughout, and special precautions taken by numerous automatic devices to relieve the shocks of water ramming incidental to arresting and shutting off a heavy column of moving water, say four miles long instead of two.

Tunnel Capacity.—In designing the system, the capacity of tunnel must be such as to conduct the maximum possible quantity of water ever likely to be required, which as you already know I have figured out at 25,000,000 gallons per day. As the tunnel would be about six and a half feet high and 4 and a half feet wide, there would be no difficulty in gravitating double this quantity if it was wanted, provided it could be secured from the Loch.

Tunnel Protection.—As the tunnel would be cut out of solid rock, it would be necessary to concrete the entire bottom, also the sides, part way up, in order to secure a fairly smooth surface. The remaining portion of the sides and top could be securely and substantially timbered for protection against caving, due to loosening and deterioration of rock.

Regulation of Supply.—It is the intention that the flow of water supply inside and along the tunnel from the lake should only cover the bottom, and run freely like an open ditch into a small bulkhead at the end where supply main is attached, and this flow can easily be regulated by means of gate and sluice valves. This is one of the features of safety and simplification, because the steel storage tank at Two Mile Point will keep full, the fluctuation of level being confined generally to very small limits and at times to overflow according as the supply from the Loch is regulated.

Capacity of Sixteen Inch Supply Main.—Taking the lowest level of water in bulkhead at mouth of tunnel to be 320 feet, I find that one sixteen inch supply main will deliver water into steel storage tank when full, at an elevation of 300 feet at the uniform rate of fully 2,000 gallons per minute, which is equal to about 3,000,000 gallons per day, sufficient for 30,000 people or say four times your present population.

Average Flow.—While 2,000 gallons per minute would be for this population the average supply per minute for domestic use, the maximum during some time of the day may be nearer double this quantity, or say 3,500 gallons per minute, while at times it may fall far below the average to say 1,000 or even 500 gallons per minute.

Not only has this maximum amount for domestic conditions to be taken into account when designing a water supply system, but an addition to this has to be provided for good fire service, which in this case I would figure at 1,500 gallons per minute for seven good fire streams.

Maximum Demands.—The maximum total therefore can be taken at say 5,000 gallons per minute as a possible requirement, equal to a rate of 7,000,000 million gallons per day, which is considerably more than double the average rate above stated.

Duplicate Pressure Mains.—There would therefore require to be two eighteen inch supply mains from storage tank to town to furnish this amount efficiently at 100 pounds pressure in town.

Single Pressure Main Suitable for 15,000 Population.—As it will be some years before the population of 30,000 will be reached, I only propose at present to lay one of these eighteen inch pressure mains, which is enough for the maximum demands of a population double your size, or say 15,000 people. The duplicate eighteen inch main can be laid and connected up when required in after years.

The sixteen inch main, however, is large enough and will not require to be duplicated until your population reaches 20,000.

Advantages.—I am explaining all this to show you the advantage of the proposed design from every standpoint of safety, reliability, simplicity and efficiency in operation, as well as the great economy secured in cost of construction.

River Crossing.—The question of crossing the Kaministikwia River with water supply will be a special piece of work which will require to be well and carefully designed and carried out.

I propose therefore that duplicate eighteen inch mains of special design and strength be laid in and across the bottom of the river bed at a proper depth, so as to be safe at all times and free from every possibility of interference by dredging or boat anchors, etc. These two eighteen inch mains should both be laid with the first part of the work to be undertaken and should be brought close together and connected on both banks with the pressure main, but each to have independent connections by means of controlling and shut-off valves.

Estimate of Cost.—I submit herewith the following estimate as a close approximation to the probable cost of this proposed undertaking:—

FORT WILLIAM GRAVITATION WATER SUPPLY FROM LOCH LOMOND.

Estimate of Cost.

(1) Tunnel and Submerged Inlet.

500	lineal feet of 36-inch steel submerged inlet pipe	$10,000
500	" " open rock cut	10,000
	Concrete bulkhead screen and valve house	3,000
4,500	lineal feet rock tunneling, 6½ feet x 4½ feet	60,000
200	" " vertical shaft	5,000
	Concrete lining, bottom and sides	10,000
	Timbering top, etc.	5,000
	Bulkhead, Basin and valve chamber	3,000
	Engineering and contingencies	14,000
	Total	$120,000

(2) Sixteen Inch Wood Supply Main.

9,500	lineal feet 16 inch special wood supply main with stop valves, air valves, blow off, etc.	$15,000
	Engineering and contingencies	2,000
	Total	$17,000

(3) Compensating Steel Storage Tank.

30	feet diameter by 90 feet high, complete with valves and fittings	$15,000
	Engineering and contingencies	1,000
	Total	$16,000

(4) 18 Inch Cast Iron Pressure Service Main.

12,000	lineal feet 18 inch cast iron pressure main with valves and fittings	$40,000
1,000	lineal feet 24 inch main with valves	5,000
	Engineering and contingencies	3,000
	Total	$48,000

(5) River Crossing.

1,000 lineal feet special 18 inch piping with all valves and fittings, also laying complete and coupling to service main	$10,000
Engineering and contingencies	4,000
Total	$14,000

Summary of Total Cost.

Total Cost.—1. Loch Lomond and Tunnel	$120,000
2. 16 inch Wood Supply Main	17,000
3. Compensating Steel Storage Tank	16,000
4. 18 inch Cast Iron Pressure Main	48,000
5. River Crossing	14,000
Grand total	$215,000

Surplus Water Power.—I have not thought it worth while to seriously consider the question of what power would be available from the surplus water which Loch Lomond could supply for some years to come until such time as the growth of population would require the entire supply for domestic consumption, because in the first place, the amount of power would be quite small and would mean an additional expenditure of at least $100,000 for suitable installation to utilize it, besides the initial cost would eventually be wasted and thrown away when the water had to be diverted for domestic purposes.

It would, of course, be practicable to convey water by means of a thirty-six inch pipe to some point in the low flats where a tail race discharge could be obtained and thus secure an effective hydraulic head of say 240 feet.

Then taking 12,000 gallons per minute, 600 electrical horse power could be obtained, but when all charges for production were taken into account, the actual cost per horse power per annum would likely be about $20. This would probably be much more than the cost of securing it from a large water power development, such as is possible and contemplated at Kakabeka Falls.

I must, under the circumstances, dismiss therefore the question of power from Loch Lomond as unprofitable and unworthy of serious consideration.

In conclusion I ought to state that the project for bringing Loch Lomond water supply into Fort William by natural gravitation appeals to me strongly on sanitary and financial grounds because of the abundant supply of beautiful, soft, pure quality of water.

I must congratulate Fort William at the prospect of having within easy reach one of the finest water supply systems possible.

Yours respectfully,

John Galt,
Consulting Engineer.

Report of the Committee on Sewage and Water Supply (West) on a plan for the Disposal of Sewage and also for the Water Supply of the Town of Rainy River.

To the Chairman and Members of the Provincial Board of Health:

Gentlemen,—Your Committee on Sewage and Water Supply (West), having looked over the plan for the disposal of sewage, and also for water supply for the Town of Rainy River, are of opinion,

(1) That the pumping station shown on the plan is too near the proposed outlet of the sewers.

(2) That the sewage of the town should not be discharged in a raw condition into the Rainy River.

Your Committee would therefore recommend—

(1) That the pumping station of the town water supply be placed further up the Rainy River, viz., above the creek which discharges into the Rainy River, about three-quarters of a mile, east of the town; and

(2) That a septic tank should be placed at the mouth of the main sewer outlet, and connected with this sewer, so that a comparatively pure effluent would be discharged.

Your Committee would further recommend that the municipality of Rainy River be requested to present amended plans for sewers and water service before beginning construction.

All of which is respectfully submitted,

Signed,

J. J. Cassidy,
Alex. Thompson,
Chas. A. Hodgetts.

Toronto, 1906.

Report of the Committee of the Provincial Board of Health *re* the Disposal of the Sewage of the City of Toronto.

Adopted at Special Meeting of the Board held Feb. 16th, 1906.

To the Chairman and Members of the Provincial Board of Health:

Gentlemen,—In the consideration of this very important subject your Committee in common with the other members of your Board has had the advantage of the explanations of the City Engineer, Mr. C. H. Rust, the City Medical Health Officer, Dr. Chas. Sheard, and the Chairman of the Local Board of Health, Ald. Geary. Your Committee has also had subsequent conferences with the Medical Health Officer and the City Engineer.

The City Engineer's Department has also presented to the Laboratory of your Board 560 samples of sewage collected at intervals throughout the whole of the past year, from six large sewers at different localities throughout the City, and also from the Don River at site of the Grand Trunk railway bridge. A tabulated report of the chemical analyses of these samples has been furnished by the head of the laboratory, Dr. John Amyot, and is submitted herewith. Your Committee has also obtained data from the experience of other communities.

The propositions submitted to the City Council of Toronto, by the City Engineer and subsequently to your Board are here given in the following excerpts from his report for the year 1901:—

"(1) The construction of an intercepting sewer, capable of daily handling the sewage of a population of 500,000, to discharge into Lake Ontario, a distance of three miles east of the east city limits, being about nine miles from the water works intake pipe. There may be some objection raised to turning crude sewage into the same body of water from which we procure our water supply, but considering the immense area of the lake, and the distance from the sewer outlet to the water supply intake pipe, I am strongly of the opinion that there will not be the slightest danger for many years to come. From the Observatory reports of the past twenty years it is ascertained that the prevailing winds are from a westerly direction. Even with a strong wind blowing from the east, I do not consider it possible that any pollution can occur.

The probable cost of this scheme is as follows:—

Capacity of Intercepting Outfall Sewers	100,000,000 galls. per day.
Capacity of Forcing or Lifting Mains	100,000,000 galls. per day.
Capacity of Pumping Plant, including reserves	75,000,000 galls. per day.

Outfall Sewer (including outlet into lake): From Broadview Avenue along Gerrard Street, to 3 miles east of city limits and one-half mile into the lake, including overflows, creek crossings, land damages, etc., and emergency overflow to lake at mouth of tunnel and manholes...	$852,000 00
Intercepting sewer: Along Eastern Avenue, from Queen Street to Boadview Avenue, connections etc.	28,500 00
Intercepting sewer: Along Front Street, Wellington Street, etc., from Broadview Avenue to Dufferin Street, including siphon under Don, Rosedale Interceptor, overflows, etc., and manholes	338,900 00
Force mains: Eastern Avenue to Gerrard Street, along Broadview Avenue, 2 48-inch mains	84,000 00
Pumping station: Total capacity 75,000,000 gallons per day against 42 ft. total head, including station house, screening chambers, wells, etc., and site	214,000 00
Net total	$1,517,400 00
Add 15 per cent.	227,610 00
Gross total	$1,745,010 00
1st cost say	$1,750,000 00
Annual cost	17,000 00

(2) The construction of septic tanks in the vicinity of Ashbridge's Bay, near the Woodbine, and the purchase of 500 or 600 acres of land immediately north of Danforth Avenue, in the vicinity of Woodbine Avenue, to be used as filter beds, the sewage to be lifted to this point. The land proposed to be purchased is of a sandy gravelly nature and admirably suited for the purpose. I do not consider that any profit should be anticipated from the sale of the produce. During the continuance of very cold weather and when the wind is a westerly direction, it would be economical and quite satisfactory to turn the effluent directly into the lake after septic tank treatment. It would then only be necessary to pump the sewage to the farm about eight months in the year.

The approximate cost of this proposition is as follows:—

Capacity of Intercepting Sewers	100,000,000	galls. per day.
Capacity of Septic Tank, 25,000,000 and 25 per cent. reserve	31,250,000	galls. per day.
Capacity of Pumping Pl't, 25,000,000 & 50 per cent. reserve	37,500,000	galls. per day.
Capacity of Forcing Main	25,000,000	galls. per day.
Capacity of Filter Areas	25,000,000	galls. per day.

High Level Sewer: Dufferin Street sewer, Garrison Creek sewer to outlet for storm water into lake near Woodbine, including Rosedale and Garrison Creek interceptors, connections, land damages, siphon under Don, manholes, etc.	$731,541 00
Low Level Sewer: Garrison Creek, along Front Street and Eastern Avenue to Woodbine, including siphon under Don, overflows, damages, etc., and manholes	257,100 00
Septic Tank: 7 feet deep, 16½ acres, with 25 per cent. added for reserves in storms, etc., including excavation and land, etc.	344,700 00
Force Main: One 48-inch main, septic tanks to upper side of filter area.	120,000 00
Filter Main: 600 acres, 300 acres at present prepared houses, etc.	265,000 00
Pumping Station: Total capacity 37,500,000 galls. per day, against 160 ft. head, including screens, wells, site, building, etc.	355,000 00
Net total	$2,073,341 00
Add 15 per cent.	311,001 00
Gross total	$2,384,342 00
1st cost say	$2,385,000 00
Annual cost	76,000 00

(3) The disposal of the sewage by means of septic tanks and bacteria beds.

The probable cost of this scheme is as follows:—

Septic tanks and beds situated south of Queen Street, between Knox Avenue and Woodbine—

Capacity of Intercepting Sewers	100,000,000 galls. per day.
Capacity of Septic Tanks	31,250,000 galls. per day.
Capacity of Bacteria Beds	31,250,000 galls. per day.
Capacity of Pumping Plant	37,500,000 galls. per day.

High Level Sewer: Dufferin Street, Garrison Creek sewer to outlet for storm water into lake near Woodbine, including Rosedale, Garrison Creek interceptors, connections, land damages, siphon under Don, manholes, etc.	$731,541 00
Low Level Sewer: Garrison Creek, along Front Street and Eastern Avenue to Woodbine, including siphon under Don, overflow damages, etc., and manholes	257,100 00
Septic Tanks: 7 feet deep, 16½ acres with 25 per cent. reserve in storms, including excavations, land, etc.	344,700 00
Bacteria Beds: 3½ feet deep, 45 acres with 25 per cent. reserve, including land, excavations, etc.	770,000 00
Pumping Station: Total capacity 37,500,000 gallons per day against 40 ft. head, including pumping wells, screens and main to beds, also station building	103,000 00
Net total	$2,206,341 00
Add 15 per cent.	330,951 00
Gross total	$2,537,292 00
1st cost say	$2,540,000 00
Annual cost	37,000 00

(4) The question of treating the sewage from the district west of Spadina Avenue by septic tanks and single bacteria beds at the outlet of the Garrison Creek sewer, where sufficient area of land could be obtained by cribwork and the filling in of a portion of the lake; and the sewage from the east end of the city to be treated in a similar manner at Eastern Avenue, east of Leslie Street.

The approximate cost of this scheme is as follows:—

Capacity of Intercepting Sewers	100,000,000 galls. per day.
Capacity of Septic Tank	31,250,000 galls. per day.
Capacity of Bacteria Beds	31,250,000 galls. per day.
Capacity of Pumping Plants	37,500,000 galls. per day.

Western Intercepting Sewer: Dufferin Street to Spadina Avenue, along Front Street and north of G. T. R., including land damages, connections, and Garrison Creek overflow, manholes, etc.	$61,500 00
Eastern Intercepting Sewer: Simcoe Street to Queen Street, along Front Street and Eastern Avenue, including siphon under Don, land damages, connections, overflows, Rosedale interceptor, manholes, etc.	256,100 00
Eastern Pumping Station: Total capacity to lift 24,000,000 gallons per day 25 feet, including buildings, with screens, etc.	32,000 00
Western Pumping Station: Total capacity to lift 13,500,000 gallons per day 12 feet, including buildings, wells, screens, etc.	8,500 00
Western Septic Tank: 7 acres, including filling and cost of 2 acres of land, etc.	143,400 00
Eastern Septic Tank: 12 acres, including filling, grading, cost of land, etc.	252,000 00
Western Bacteria Beds: 16 acres, including cribbing, filling and filter material	374,000 00
Eastern Bacteria Beds: 30 acres, including filling and filter material	505,000 00
Net total	$1,632,500 00
Add 15 per cent.	244,875 00
Gross total	$1,877,575 00
1st cost say	$1,880,000 00
Annual cost	40,000 00

Proposition 1.—Regarding this it will not be necessary to say much to your Board. We cannot recommend the Board to entertain a proposal to perpetuate at another portion of the lake or elsewhere, the nuisance which at present exists in the bay and lake front of the City, let alone recommending its perpetuation to an increased extent.

The population of the City in the directory just published is reckoned to be 305,000, and the calculation of the City Engineer is to take charge in the not distant future of the sewage of a population of half a million, including the surface pollution of the extensive area enclosed within the City limits, and the waste products of numerous and extensive manufactories.

The amount of organic matter discharged into the bay and its vicinity as estimated by the City Engineer in 1901, amounted to 95 tons. If this were hauled to the lake-front in a daily procession of 100 carts the public would better estimate its significance.

Proposition No. 4.—The conducting of portions of the sewage of the City to the vicinities of the Old Fort and of Eastern Avenue near Leslie St. and treating them by septic tanks and bacteria beds at these points, is not viewed favorably by the Engineer himself, who considers it "might in the future be somewhat of a nuisance." For the same and other reasons your Committee does not think favorably of it. The data before us do not show definitely that it embraces the contents of the whole sewerage system of the city; and we do not favor the construction of bacteria beds in connection with Toronto sewage-disposal except as an experiment on a small scale. The point will be further discussed under proposals 2 and 3.

Propositions 2 and 3 are now left for comparison and your Committee favors the former, and we would give our reasons under the following heads:—

The results of treatment have been more extensively observed and more definitely and reliably reported in connection with sand-filtration; and it has been shown right here in our own province quite recently at Berlin. that the treatment has been so efficient as to remove 98 per cent. of organic matter, with an acreage about the same as that estimated by the City Engineer as necessary and obtainable. This is a new plant and has not been long under observation, but plants in other places outside of this province have shown equally good results.

Experiments with bacteria beds of the most approved pattern do not give as satisfactory results. It is stated that at Columbus, Ohio, it has been found that the bacteria beds require nearly double the surface area considered necessary in the places from which the City Engineer obtained his data.

As to maintenance and ill-effects of neglect we think the observations of your Board, both in this Province and elsewhere, showed that less skill is required for running sand-filter-beds than for bacteria-beds, and that less nuisance as a consequence is likely to arise from neglect. We are not speaking of the amount of help required, but of the quality and results.

The economic aspect is one which is by some not supposed to come within the province of sanatarians, but for practical results it is important, if secondary. In adopting the sand filtration system the city will be acquiring a tract of land which will always be a valuable, and increasingly valuable, asset.

The intrinsic value of bacteria beds apart from the site, must be estimated as junk, and the property will be much less valuable than the land plant.

We must also bear in mind what we have already said about the probability with bacteria beds of larger beds being required as well as improvements in the plant, in view of the experimental condition of treatment by bacteria-beds.

The cost of help annually in the working of the plant is estimated by the engineer at less than that required for the same treatment by filter-beds, but we believe this will be more than out-balanced by the increased first outlay and experimental uncertainty.

If it should be asked why in some places bacteria-beds are recommended in preference to sand-filtration, it may be answered that all places have not been provided by nature with such an excellent situation for a sand-filtration as is Toronto near its eastern city limits.

In conclusion your Committee is, therefore, of opinion that of the schemes proposed by the City Engineer, Proposition 2, is the one to be recommended by your Board, on the assurance of the City Engineer that the soil is suitable, and with the proviso that the city will install properly constructed filter-beds, with thorough underdrainage, and will provide for efficient maintenance of the same.

If it be necessary to say anything more regarding the scheme of pouring the crude sewage of Toronto into the lake in the neighborhood of Scarboro Heights, it may be added that it is not in the interests of the city that it should lose sight of the possibility that some day it may be found desirable to utilize this neighborhood for the providing of a fresh water supply to the rapidly growing city; but this question is not now before us and we do not need to further enlarge upon it.

Signed,

W. J. Douglas,
R. P. Boucher,
Wm. Oldright.

Report of the Committee on Sewage and Water (East) on the Prescott Water Supply.

Adopted by the Board Feb. 16th, 1906.

To the Chairman and Members of the Provincial Board of Health:

Gentlemen,—Your Committee on Sewage and Water Supply, East, with reference to the Report of the Special Committee appointed to investigate the water pollution of the Town of Prescott, beg leave to recommend the adoption of the report and the suggestions therein contained.

Signed,

W. J. Douglas,
R. P. Boucher,
Wm. Oldright.

Report of Special Committee on Prescott Water Supply.

Gentlemen,—We beg to submit for your consideration the following report *re* the Water Supply of the Town of Prescott:—

The present source of supply is the River St. Lawrence, the intake being situated about 350 feet from the shore at a point a little west of the property of the Messrs. Wiser, who have operated a large distillery at this point for many years.

The pump house is adjacent to this property, being situated to the west thereof.

From the intake the water is conducted to the pumping well through an iron pipe.

At the time of our visit we found on the distillery property, adjacent to the river indeed partially if not wholly upon the wharf, a series of sheds in which at certain seasons of the year several hundred head of cattle are fed upon the distillery grain and swill.

In the water in the immediate vicinity of the wharf there was every evidence of septic action going on, caused doubtless, by the accumulation of vegetable and animal matters which find their way from these sheds, and possibly from the distillery sewage which doubtless is emptied close by, though of this latter statement we could ascertain nothing definite from the Mayor and other gentlemen who accompanied us. We further observed that floating material was being carried in a westerly direction towards "the intake" in direct opposition to the easterly flow of the St. Lawrence.

An inspection was made of the river front above the pump house as far as the brewery, about a mile and a half to the west. In this direction the sewage of several private houses runs into the river, and the brewery also discharges its sewage similarly. To the east of the brewery closer to the town a field was shown us upon which the distillery proprietors deposit at certain seasons of the year the manure from the byers, the ground being rocky at this point it can be well understood that considerable seepage would occur.

At our request Mr. M. McPherson, Supt. of the Water and Light Commissioners, has made a series of float tests, appendix "A," with a view of our being able to speak definitely regarding the current noticed as setting in a westerly direction at Wiser's wharf. The report attached shows the presence of westerly eddy at the point mentioned, twenty-five feet in width and running westerly as far as the S. W. corner of the pump house wharf, thence southerly towards the intake where it is lost in the general current and carried easterly. It will be further noted that the current runs from the direction of the brewery towards the pump house wharf where it strikes the eddy just referred to. Again further to the south and at the intake there is the general current of the St. Lawrence flowing easterly.

After a study of the question it appears to us that the location of the intake pipe is most unfortunate, as at times there is every possibility of pollution of the waters at the intake, and should a break occur in the joints especially those nearer the shore end, polluted waters would be drawn in, as to this being an existing condition we have no proof.

Further, we would point out that the sewage of Brockville is emptied into the St. Lawrence at a point some miles farther up the river, and pollution from this source has to be considered as well as the pollution from the many passing vessels during the season of navigation.

We would further point out that Dr. Amyot in his report on the laboratory examination of the specimens taken during the months of November and December, 1905, by Dr. McPherson, M.H.O., at many different points in the river as suggested at the time of our visit, states that none of these sources were free from bacterial infection, and your attention is directed to the fact that the waters from the brewery to the intake wherever they were taken showed at some time or another the presence of intestinal bacteria, which would stamp the source as being unfit for use as a supply for domestic purposes, a fact which is emphasized by the amount of chlorine found to be present.

In conclusion we would condemn the present source of supply; recommend the authorities to urge the boiling of all water used for drinking purposes, either until a new source is obtained or provision is made for the permanent protection of the public by the efficient filtration of the water if the source is to continue from the present point in the river.

We would also condemn the pollution of the waters of the St. Lawrence by the emptying therein of brewery waste, the sewage of private houses and the seepage which occurs from the byers of the distillery, as well as the sewage therefrom. These are unsanitary conditions which should not exist, for no one has a right to pollute waters which are naturally pure; the municipality should provide some means for the collection of the sewage discharging into the river within the corporation limits and make provision for the treatment thereof.

All of which is respectfully submitted,

Signed,

CHAS. A. HODGETTS.
TORONTO, February 1st, 1906. R. P. BOUCHER.

APPENDIX B.

Report on the Analysis of Water Samples taken from the St. Lawrence River in the Neighbourhood of the Prescott Water Works.

Eleven sets of samples, ten in each, were examined. Two samples met with an accident in transit.

The samples were examined each for streptococci, staphylococci, colon bacilli and colonoid bacilli, or such as answer very closely to the tests for colon bacilli and yet cannot be identified positively, but are of the colon group, in any case are suspiciously intestinal in origin. The tests for these bacteria were made with I. c. c. quantities of water. The specimens were also analysed as to their chlorine content in parts per million.

The samples were collected from eleven points about the water system, viz., eleven from a town tap; eleven from the pump house tap; fifteen from points along the intake; seventeen from the intake; eleven from the mouth of the intake; nine from quarter way between the intake and the brewery; ten from half way between these points; nine from three-quarter way between same points; eleven from around Wiser's wharf; two from the channel above; and two from the channel at the Point.

Of these 108 specimens, fifty-three showed infection with some of the above bacteria separate or in combination; none of the sources of water escaped as will be seen by the following table:—

	Specimens.	Infected.
Tap	11	3
Pump house	11	4
Along intake	15	2
Intake	17	12
Mouth of intake	11	6
Quarter way	9	4
Half way	10	6
Three-quarter way	9	5
Wiser's wharf	11	8
Channel above	2	1
Channel at Point	2	2

None of the sets of samples showed freedom from infection, as may be seen from the accompanying table.

Nov. 8	7
" 11	5
" 15	4
" 17	5
" 22	3
" 29	4
Dec. 1	2
" 15	2
" 20	7
" 28	5
" 29	7

As to chlorine there is a variation in the specimens from 6 to 10.

None of the sets of specimens from any one point show constancy in this connection, even these specimens from the channel.

All these infections which are sewage in origin show undoubted pollution, also show that the currents are alterable and this confirmed very strongly indeed in the results to be observed in the findings as to chlorine content.

Nothing but efficient filtration could make these waters safe drinking waters on a large scale.

There follows tables of the details of the bacterial and chemical examinations made in connection with these samples.

Signed,

John A. Amyot.

Laboratory Reports

By J. A. AMYOT, M.D.

Presented at the Quarterly Meeting Held January 31st, 1906.

To the Provincial Board of Health of Ontario:

GENTLEMEN,—I have the honor to present you the following report of the work done in the Laboratory during the quarter ending Dec. 31st, 1905.

Summary of specimens examined during the quarter ending Dec. 31st 1905.

Date 1905	Diphtheritic Swabs				Tuberculous Sputa		Typhoid Bloods		Miscellaneous Specimens	Waters		Total number for month
	Release		Diagnosis									
	+	–	+	–	+	–	+	–		Chemical	Bacterial	
October	7	22	27	33	50	103	37	92	11	3	118	503
November...	16	23	34	31	46	120	47	63	7	0	155	542
December...	33	35	38	49	38	112	25	32	6	5	156	529
	56	80	99	113	134	335	109	187	24	8	429	1,574
	136		212		469		296			437		
	348											

Add to this 98 specimens of sewage examined for the City of Toronto, we have a total of 1,672 examined during the quarter.

Summary of the specimens examined during the year ending Dec. 31st, 1905.

Date 1905	Diphtheritic Swabs				Tuberculous Sputa		Typhoid Bloods		Miscellaneous Specimens	Waters		Total number for quarter
	Release		Diagnosis									
	+	–	+	–	+	–	+	–		Chemical	Bacterial	
First quarter	34	63	64	181	109	265	28	97	21	0	126	988
Second "	53	62	76	142	170	390	34	123	36	0	156	1,242
Third "	47	112	35	63	188	281	82	302	169	33	110	1,422
Fourth "	56	80	99	113	134	333	109	187	24	8	429	1,572
Totals	191	317	274	499	601	1,269	253	709	250	41	821	5,224

Add to this 560 specimens of sewage examined for the City of Toronto during the year we have a total of 5,784 specimens examined during the year 1905.

Report from Laboratory of Provincial Board of Health for Quarter ending December 31, 1905.

County.	Municipalities.	Diphtheritic Swabs.				Tuberculous sputa.		Typhoid Bloods.		Miscellaneous specimens.	Waters.		Total number for quarter.
		Release.		Diagnosis.							Chemical.	Bacterial.	
		+	—	+	—	+	—	+	—				
Algoma	3				1	1	1						3
Brant	4			1		1		1	1	1		6	11
Bruce	11	2	15	1	3		5			2			28
Carleton	2						2			1			3
Dufferin	4					1	5		1				7
Elgin	4			1	2		2		1				6
Essex	13	2	6			7	10	4	6			5	40
Frontenac	13	38	36	24	22	21	49	7	12	7		7	223
Grey	11	3	9	6	5		6	1	4	1		1	36
Haldimand	8			1		1	3	2	2			2	11
Haliburton													
Halton	4					2	3					2	7
Hastings	17			2	1	6	12	3	4	2		4	34
Huron	12					4	6	1	2	1		5	19
Kent	8			1		3	12	1	2			4	23
Lambton	16	1		1		3	10	1	6			4	26
Lanark	14	1	3	8	6	3	7	2	4			54	88
Leeds & Gren.	25					9	6	6	3	1		50	75
Lenn. & Add.	9			1	1	2	7	1	1				13
Lincoln	7			1		3	4	1	2	1		3	15
Middlesex	3						1	5	20			9	35
Muskoka	5	1	1	4	5	2	3	9	6			3	34
Nipissing	7				1	1	3		2			11	18
Norfolk	8			3		2	4	4	2			6	21
North. & Dur.	13	1	2		2	4	14	2	1	1		3	30
Ontario	8					2	5		4			4	15
Oxford	18			1	1	2	13	3	7	1		65	93
Parry Sound	6				4	1	14	6	14		3	4	46
Peel	6	1	1	1	1	1	2	1		1		5	14
Perth	9					2	2	3	2		5	8	22
Peterboro.	4		1	2	8		5		2	1		13	32
Pres. & Russ.	3					1	1	3					5
Prince Edw'd	4						1		3				4
Rainy River	4			2						1		10	13
Renfrew	12			3	1	6	14	1	5			14	44
Simcoe	22			9	10	11	16	5	6			8	65
Stor., D. & G.	6					1	8						9
Thunder Bay	7							6	6			5	17
Victoria	7	1	1	5	3	2	6		2			2	22
Waterloo	12			2	1	5	8	2	5	1		16	40
Welland	8			1	3	1	2					4	11
Wellington	11		3	3	5	3	7	2	1			6	30
Wentworth	9				1		3	1	3	1		4	13
York	20	5	2	15	26	20	53	25	45			76	267
Yukon N.W.T.												6	6
Totals		56	80	99	113	134	335	109	187	24	8	429	1574

The examination of the Toronto city water was continued during this quarter as during the previous ones. There follows a table showing the conditions found on the various days on which it was examined during the year.

Two hundred and thirty-five (235) were examined on as many days, of these (33) thirty-three, or 14.05 per cent. of the whole showed infection with presumably intestinal bacteria. This infection takes place probably at the intake. The typhoid mortality, 40 last year, still goes on, not to say anything about the periodic outbreaks of other intestinal troubles, diarrhoea especially.

From the City Hall we have report of 197 cases of typhoid during the year, but the 4 chief hospitals of the city record 378 cases during the same period. It cannot be that typhoid fever is being reported at the City Hall. It is nothing short of criminal negligence that allows of water infected as Toronto's is to be supplied to its citizens. Efficient filtration is necessary before there will be any amelioration in this respect.

There follows reports on the series of waters examined for Ingersoll and Prescott, also on the 560 specimens of sewage analyzed for the city of Toronto.

Table Showing the Progress Year by Year in the Demands upon Work on the Laboratory.

Years.	Diphtheria Exudates.	Tuberculous Sputa.	Typhoid Blood.	Miscellaneous.	Chemical Waters.	Bacterial Waters.	Totals.
1899....	375	629	164	57	29	116	1,370
1900....	526	703	221	25	33	194	1,669
1901....	1,018	1,006	405	98	38	215	2,780
1902....	666	1,056	415	593 { 66 459 sewerage 68 others at basin }	65	206	3,005
1903....	851	1,153	513	87	231	291	3,126
1904....	1,444	1,447	812	191	59	628	4,586
1905....	1,281	1,870	662	810	41	811	5,787

Examinations of Toronto Water Supply for the Year 1905.

Date 1905	Laboratory Numbers	Streptococci	Staphylococci	Colon Bacilli	Other Fermenting Bacteria Not Distinctly Colon	Chlorine in Parts per Million.	Date 1905	Laboratory Numbers	Streptococci	Staphylococci	Colon Bacilli	Other Fermenting Bacteria Not Distinctly Colon	Chlorine in Parts per Million
Jan. 3	0024	—	—	—	—	7	Jan. 24	0237	—	—	—	—	7
" 4	0041	—	—	—	—	7	" 25	0244	—	—	—	—	7
" 5	0056	—	—	+	—	7	" 26	0256	—	—	—	—	7
" 7	0072	—	—	—	—	7	" 27	0267	—	—	—	—	7
" 9	0080	—	—	—	—	7	" 28	0275	—	—	—	—	7
" 10	0097	+	—	+	—	7	" 30	0283	—	—	—	—	7
" 11	0101	—	—	—	—	7	" 31	0303	—	—	—	—	7
" 12	0138	—	—	—	—	7	Feb. 3	0807	—	—	—	—	7
" 14	0157	—	—	—	—	7	" 3	0322	—	—	—	—	7
" 16	0165	-	—	—	—	7	" 4	0334	—	—	—	—	7
" 17	0174	—	—	—	—	7	" 6	0239	—	—	—	—	7
" 18	0187	—	—	—	—	7	" 7	0349	—	—	—	—	7
" 19	0196	—	—	—	—	7	" 8	0356	—	—	—	—	7
" 20	0209	—	—	—	—	7	" 9	0366	—	—	—	—	7
" 21	0217	—	—	—	—	7	" 10	0389	—	—	+	—	7
" 23	0228	—	—	—	—	7	" 11	0396	—	—	—	—	7

Examinations of Toronto Water Supply for the Year 1905.—*Continued.*

Date 1905	Laboratory Numbers	Streptococci	Staphylococci	Colon Bacilli	Other Fermenting Bacteria Not Distinctly Colon	Chlorine in Parts per Million
Feb. 13	0405	—	—	—	—	7
“ 14	0414	—	—	—	—	7
“ 15	0415	—	—	—	—	7
“ 16	0424	—	—	—	—	7
“ 17	0432	—	—	—	—	7
“ 18	0449	—	—	—	—	7
“ 20	0456	—	—	—	—	7
“ 21	0463	—	—	—	—	7
“ 22	0478	—	—	—	—	7
“ 23	0485	—	—	—	—	7
“ 24	0498	—	—	—	—	7
“ 25	0507	—	—	—	—	7
“ 27	0517	—	—	—	—	7
“ 28	0525	—	—	—	—	7
Mar. 1	0541	—	—	—	—	7
“ 2	0546	—	—	—	—	7
“ 3	0561	—	—	—	—	7
“ 4	0573	—	—	—	—	7
“ 8	0609	—	—	—	—	7
“ 9	0618	—	—	—	—	7
“ 10	0634	—	—	—	—	7
“ 11	0650	—	—	—	—	7
“ 13	0665	—	—	—	—	7
“ 14	0678	—	—	—	—	7
“ 15	0691	—	—	—	—	7
“ 16	0701	—	—	—	—	7
“ 17	0716	—	—	—	—	7
“ 21	0747	—	—	—	—	7
“ 23	0764	—	—	—	—	7
“ 24	0774	—	—	—	—	7
“ 25	0777	—	—	—	—	7
“ 27	0781	—	—	—	—	6
“ 28	0796	—	—	—	—	7
“ 29	0812	—	—	—	—	7
“ 30	0820	—	—	—	—	7
“ 31	0844	—	—	+	—	8
Apr. 7	0927	—	—	—	—	7
“ 8	0935	—	—	—	—	7
“ 11	0958	—	—	—	—	7
“ 13	0982	—	—	—	—	7
“ 14	0996	—	—	—	—	7
“ 15	1004	—	—	—	—	7
“ 17	1020	—	—	—	—	7
“ 19	1057	—	—	—	—	7
“ 20	1071	—	—	—	—	7
“ 21	1078	—	—	—	—	7
“ 22	1084	—	—	—	—	7
“ 27	1140	—	—	—	—	7
May 1	1175	—	—	—	—	7
“ 2	1197	—	—	—	—	7
“ 3	1218	—	—	—	—	7
“ 4	1233	—	—	—	—	7
“ 5	1248	—	—	—	—	7
“ 8	1277	—	—	—	—	7
“ 9	1285	—	—	—	—	7
May 10	1311	—	—	—	—	7
“ 16	1362	—	—	—	—	7
“ 17	1370	—	—	—	—	7
“ 18	1386	—	—	—	—	8
“ 19	1390	—	—	—	—	8
“ 20	1403	—	—	—	—	7
“ 22	1413	—	—	—	—	7
“ 23	1437	—	—	—	—	7
“ 26	1466	—	—	—	—	7
“ 27	1470	—	—	—	—	7
“ 30	1491	—	—	+	—	7
“ 31	1503	—	—	—	—	7
June 1	1522	—	—	—	—	7
“ 2	1529	—	—	—	—	7
“ 6	1532	—	—	—	—	7
“ 7	1551	—	—	—	—	7
“ 8	1566	—	—	—	—	7
“ 9	1573	—	—	—	—	7
“ 11	1588	—	—	—	—	7
“ 12	1594	—	—	—	—	7
“ 13	1608	—	—	—	—	7
“ 17	1650	—	—	—	—	7
“ 22	1695	—	—	—	—	7
“ 23	1706	—	—	—	+	7
“ 26	1740	—	—	—	—	7
“ 27	1752	—	—	—	—	7
“ 28	1765	—	—	—	—	7
“ 29	1778	—	—	—	—	7
“ 30	1799	—	—	—	—	7
July 6	1866	—	—	—	—	7
“ 11	1925	—	—	—	—	7
“ 12	1935	—	—	—	—	7
“ 13	1946	—	—	—	—	7
“ 15	1966	—	—	—	—	7
“ 18	2000	—	—	—	—	7
“ 20	2032	—	—	—	—	7
“ 22	2049	—	—	—	—	7
“ 24	2066	—	—	—	—	7
“ 25	2074	—	—	—	—	7
“ 26	2089	—	—	—	—	7
“ 28	2135	—	—	—	—	7
“ 29	2136	—	—	—	—	8
“ 31	2141	—	—	—	—	7
Aug. 1	2168	—	—	—	—	7
“ 3	2140	—	—	—	—	7
“ 4	2200	—	—	—	—	7
“ 5	2205	—	—	—	—	7
“ 7	2217	—	—	—	—	7
“ 8	2237	—	—	—	—	7
“ 15	2306	—	—	—	—	7
“ 16	2319	—	+	—	+	8
“ 17	2330	—	—	+	—	8
“ 19	2349	—	—	—	—	8
“ 18	2343	—	—	+	—	8
“ 21	2366	—	—	+	—	8

Examinations of Toronto Water Supply for the Year 1905.—*Continued.*

Date 1905	Laboratory Numbers	Streptococci	Staphylococci	Colon Bacilli	Other Fermenting Bacteria Not Distinctly Colon	Chlorine in Parts per Million
Aug. 22	2383	—	—	—	—	8
" 24	2422	—	—	—	+	8
" 25	2431	—	—	—	—	8
" 26	2440	—	—	—	—	8
" 28	2461	—	—	—	+	8
" 29	2480	—	—	—	—	8
" 30	2498	—	—	—	—	8
" 31	2507	—	—	—	—	8
Sept. 1	2521	—	—	—	—	8
" 5	2577	—	—	—	—	8
" 6	2587	—	—	+	—	8
" 8	2616	—	—	—	—	8
" 9	2620	—	—	—	—	8
" 11	2638	—	—	—	—	8
" 12	2661	—	—	—	—	8
" 13	2671	—	—	—	—	8
" 14	2696	—	—	+	—	8
" 15	2718	—	—	—	—	8
" 16	2726	—	—	—	—	8
" 18	2743	—	—	—	—	8
" 19	2768	—	—	—	—	8
" 20	2795	—	—	—	—	8
" 23	2835	—	—	—	—	8
" 25	2851	—	—	+	—	8
" 26	2873	—	—	—	+	8
" 27	2884	—	—	—	+	8
" 28	2892	—	—	—	—	8
" 29	2910	—	—	—	+	8
" 30	2945	—	—	—	—	8
Oct. 2	2961	—	—	—	+	8
" 3	2979	—	—	—	—	8
" 9	3065	—	—	—	—	8
" 10	3113	—	—	—	+	8
" 12	3129	—	—	—	—	8
" 13	3155	—	—	—	—	8
" 16	3182	—	—	—	—	8
" 17	3201	—	—	—	—	8
" 18	3214	—	—	—	—	8
" 19	3231	—	—	+	—	8
" 23 ...	3270	—	—	—	—	8
" 24	3284	—	—	—	+	8
" 27	3321	—	—	+	—	8
" 28	3335	—	—	—	—	8
" 30	3359	—	—	+	—	8
Nov. 1	3392	—	—	—	—	8
" 2	3409	—	—	—	—	8

Date 1905	Laboratory Numbers	Streptococci	Staphylococci	Colon Bacilli	Other Fermenting Bacteria Not Distinctly Colon	Chlorine in Parts per Million
Nov. 4	3421	—	—	—	—	8
" 6	3431	—	—	—	—	8
" 7	3445	—	—	+	—	8
" 8	3462	—	—	—	—	8
" 9	3486	—	—	—	—	8
" 10	3497	—	—	—	—	8
" 11	3525	—	—	—	—	8
" 13	3532	—	—	—	—	8
" 14	3567	—	—	—	—	8
" 15	3600	—	—	—	—	8
" 16	3627	—	—	—	—	8
" 17	3646	—	—	—	+	8
" 20	3680	—	—	+	—	8
" 21	3700	—	—	—	—	8
" 22	3719	—	—	—	—	8
" 23	3730	—	—	—	—	8
" 24	3738	—	—	—	—	9
" 25	3752	—	—	—	—	8
" 27	3772	—	—	—	—	7
" 28	3798	—	—	—	—	8
" 29	3818	—	—	—	—	8
" 30	3834	—	—	—	—	8
Dec. 1	2844	—	—	+	—	8
" 2	3870	—	—	+	—	7
" 4	3886	—	—	—	—	8
" 5	3900	—	—	—	—	8
" 6	3922	—	—	—	—	8
" 7	3932	—	—	—	—	8
" 8	3938	—	—	—	—	8
" 9	3946	—	—	—		6
" 11	3971	—	—	+	—	8
" 12	3979	—	—	—	—	8
" 13	3996	—	—	—	—	8
" 14	4005	—	—	—	—	8
" 15	4024	—	—	—	—	7
" 16	4039	—	—	—	—	7
" 18	4050	—	—	—	+	7
" 19	4062	—	—	—	—	7
" 20	4089	—	—	—	—	7
" 21	4115	—	—	—	—	8
" 22	4117	—	—	—	—	8
" 26	4146	—	—	—	—	8
" 27	4159	—	—	—	—	8
" 28	4193	—	—	—	—	8
" 29	4213	—	—	—	—	7
" 30	4221	—	—	—	+	7

Report on Findings in the Examination of Special Specimens collected from the Ingersoll Water Works System during November and December, 1906.

January 22nd, 1906.

To the Chairman and Members of the Provincial Board of Health:

To remove any doubt that might have existed with reference to the reported infections during the last two years of the Ingersoll water supply, the Provincial Board of Health requested that daily samples on alternate weeks be taken from mutually agreed upon points in the system from the date of the last quarterly meeting of the Board in 1905 to the end of the year. The objection had been raised that many of the samples previously reported on, had been collected in bottles other than those sterilized in our own Laboratory. Control samples were sent to Dr. A. R. Pyne at the instance of the Water Works Company.

In all 69 specimens were received on 23 occasions.

The samples were collected 23 from the "pumping well," 23 from the "tap in the pumping station" and 23 from the "tap in Dr. Neff's office."

The 23 samples from the pumping well showed colon bacilli on 4 occasions and colonoid or probably para colon on 2 occasions. The 23 samples from the tap at the pumping station showed colon bacilli on 4 occasions, streptococci on 3 occasions. and colonoid on 3 occasions.

The 23 samples from the tap in Dr. Neff's office showed colonoid bacilli on 6 occasions.

Out of 69 specimens examined

Colon bacilli were found 8 times.
Streptococci were found 3 times.
Colonoid bacilli were found 11 times.

Streptococci were found twice combined with colon bacilli in the same specimen and once alone.

Thus in the 69 specimens infection with harmful bacteria was found 20 times, or nearly 29 per cent. of the samples showed infection. The dates on which the infections were found may be seen by consulting the attached tables. It will be noticed also on looking over these tables what a variation there is in the chlorine content on the various days and even on the same days in the various specimens.

The variations in the chlorine and in the bacterial content are just what one would expect from what was seen in the inspection of the gathering area of this water system.

INGERSOLL.

Tap in Pumping Station, in 1 c. c. quantities.

Date 1905	Laboratory Numbers.	Streptococci.	Staphylococci.	Colon Bacilli.	Colonoid Bacilli.	Chlorine in parts per Million.	Date. 1905.	Laboratory Numbers.	Streptococci.	Staphylococci.	Colon Bacilli.	Colonoid Bacilli.	Chlorine in parts per Million.
Nov. 15....	3581	—	—	—	—	5	Dec. 13....	3992	—	—	—	—	4
" 16....	3612	—	—	—	—	4	" 14....	4003	—	—	—	—	4
" 17....	3633	—	—	+	—	6	" 15....	4022	—	—	—	—	4
" 18....	3658	—	—	—	—	6	" 16....	4037	—	—	—	—	4
" 20....	3670	+	—	—	+	4	" 18....	4048	—	—	—	—	4
" 28....	3796	—	—	+	—	2	" 27....	4154	—	—	—	—	3
" 29....	3806	—	—	—	—	3	" 28....	4172	+	—	—	—	3
" 30....	3832	+	—	+	—	2	" 29....	4201	—	—	—	+	3
Dec. 1....	3843	—	—	—	—	2	" 30....	4219	—	—	+	—	3
" 2....	3868	—	—	—	—	3	1906						
" 4....	3881	—	—	—	—	3	Jan. 2....	15	—	—	—	+	3
" 12....	3977	—	—	—	—	4	" 3....	32	—	—	—	—	4

Pumping Well, in 1 c. c. quantities.

Date. 1905.	Laboratory Numbers.	Streptococci.	Staphylococci.	Colon Bacilli.	Colonoid Bacilli.	Chlorine in parts per Million.	Date. 1905.	Laboratory Numbers.	Streptococci.	Staphylococci.	Colon Bacilli.	Colonoid Bacilli.	Chlorine in parts per Million.
Nov. 15....	3580	—	—	+	—	5	Dec. 13....	3991	—	—	—	—	5
" 16....	3611	—	—	—	—	4	" 14....	4002	—	—	—	—	4
" 17....	3632	—	—	—	—	6	" 15....	4021	—	—	+	—	5
" 18....	3657	—	—	—	—	5	" 16....	4036	—	—	—	—	3
" 20....	3669	—	—	—	+	4	" 18....	4047	—	—	—	—	5
" 28....	3795	—	—	+	—	3	" 27....	4153	—	—	—	—	4
" 29....	3805	—	—	—	—	3	" 28....	4171	—	—	—	—	3
" 30....	3831	—	—	+	—	2	" 29....	4200	—	—	—	—	4
Dec. 1....	3841	—	—	—	—	2	" 30....	4218	—	—	—	—	3
" 2....	3867	—	—	—	—	3	1906.						
" 4....	3880	—	—	—	—	3	Jan. 2....	14	—	—	—	+	3
" 12....	3976	—	—	—	—	4	" 3....	31	—	—	—	—	4

Tap in Dr. Neff's office, in 1 c. c. quantities.

Date. 1905.	Laboratory Numbers.	Streptococci.	Staphylococci.	Colon Bacilli.	Colonoid Bacilli.	Chlorine in parts per Million.	Date. 1905.	Laboratory Numbers.	Streptococci.	Stephylococci.	Colon Bacilli.	Colonoid Bacilli.	Chlorine in parts per Million.
Nov. 15....	3582	—	—	—	+	5	Dec. 13....	3993	—	—	—	—	4
" 16....	3613	—	—	—	—	5	" 14....	4004	—	—	—	—	4
" 17....	3634	—	—	—	—	5	" 15....	4023	—	—	—	—	4
" 18....	3659	—	—	—	+	4	" 16....	4038	—	—	—	—	3
" 20....	3671	—	—	—	+	3	" 18....	4049	—	—	—	—	3
" 28 ...	3797	—	—	—	+	2	" 27....	4155	—	—	—	—	3
" 29....	3807	—	—	—	—	3	" 28....	4173	—	—	—	—	3
" 30....	3833	—	—	—	+	2	" 29....	4202	—	—	—	—	3
Dec. 1....	3843	—	—	—	—	2	" 30....	4220	—	—	—	—	3
" 2....	3869	—	—	—	—	3	1906.						
" 4....	3882	—	—	—	—	3	Jan. 2....	16	—	—	—	+	3
" 12....	3978	—	—	—	—	4	" 3....	33	—	—	—	—	4

JOHN A. AMYOT,
Director of Laboratory.

IN MEMORIAM.

It is the common experience of all, that "friend after friend departs, who has not lost a friend?" But the removal from our small membership of two respected confreres, Dr. W. J. Douglas and Dr. A. Thompson, markedly emphasizes the fact. To both the call was sudden, our friend, Dr. Douglas, was in the performance of the daily round of professional visits; while Dr. Thompson had only been indisposed for a few days.

The death of either one would have been greatly felt by the Board, but the vacancy created by the removel of both has not only come as a shock, but has emphasized the fact that each filled a place at our Board which is felt and recognized by all—of different individuality yet possessing similar ideals as to their responsible duties in all that appertained to the various questions of sanitation in their bearing upon the health of the people of the province. Their arguments, discussions and recommendations were of much value to us, and in the quarterly meetings they will indeed be missed.

To the widows and members of the families our heartfelt sympathies are extended in their irreparable loss.

Dr. William John Douglas, Cobourg. Member Coll. Phy. and Surg., Ont., 1876, was Member of the Council of the College 1897-98-02, was appointed Member of the Board, June, 1900.

Dr. Alexander Thompson, Strathroy. Member Coll. Phy. and Surg., Ontario, 1866, Licentiate Medical Board, 1865, M.D. University of New York, 1861, was appointed a member of the Board August 21st, 1903.

Quarterly Report of the Secretary

CHAS. A. HODGETTS, M.D.

Presented at the Meeting of the Board held April 24th and 25th, 1906,

Monthly Returns of Contagious Diseases.

The monthly returns of contagious diseases as reported by the local authorities of the Province are as follows:—

Cases and Deaths from Contagious Diseases for Three Months ending March 31st, 1906.

	Small-pox		Scarlatina		Diphtheria		Measles		Whooping Cough		Typhoid		Tuberculosis	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	*Cases	Deaths	Cases	Deaths
January	141	0	137	4	176	21	31	4	76	10	168	51	165	165
February	55	0	120	5	168	23	62	4	143	10	442	45	200	196
March....................	27	0	113	6	169	10	115	3	68	10	243	67	187	180
	223	0	370	15	513	54	208	11	287	30	853	163	552	541

* Fort William had 626 cases and 66 deaths for the three months.

A total of 2,986 reported cases and 814 deaths, being an increase of 99 over the corresponding quarter of 1905, and 26 over the same period for 1904; the deaths being 38 more than in the preceding year and 37 less than in 1904.

The following table is submitted in order to permit of comparison between the three years 1904 to 1906:—

	1904		1905		1906	
Diseases	Cases	Deaths	Cases	Deaths	Cases	Deaths
Small-pox	192	1	34	0	223	0
Scarlatina	865	49	593	36	370	15
Diphtheria	938	148	905	129	513	54
Measles	112	5	541	11	208	11
Whooping Cough................	...	29	103	12	287	30
Typhoid	89	55	140	54	833	163
Tuberculosis	564	564	559	534	552	541
	2,960	851	2,887	776	2,986	814
Scarlatina, death rate	5.8%		6.2%		4.0%	
Diphtheria, " "	15.7%		14.4%		10.5%	

The increase in the number of smallpox cases is much to be regretted as the enforcement of vaccination and re-vaccination in every municipality in this Province would prevent the occurrence of small outbreaks of this disease which, whenever it appears, is accompanied with so much inconvenience to families, hindrance to business and expense to all. The disease has been as a rule of a mild type, but instances have been many where the disease has been semi or confluent in character, and I need hardly add in no instance has it occurred in the recently vaccinated or re-vaccinated.

As regards the sanitary environment of those attacked, the most of the patients have been found to be living in surroundings that would not be called filthy, dirty or unsanitary, the victims being those who had neglected to secure immunity by vaccination.

In this connection I desire to again point out that the municipal authorities, who are called upon to provide funds for the care of smallpox patients, have themselves to blame for neglecting to enforce the provisions of the Vaccination Act, and the people of the province generally have to thank themselves and an uneducated press for the consideration they have given to the false dicta which has been set forth by the body opposed to vaccination—the members of which know as much practically about the subject as they know theoretically of the facts and deductions, which the majority of scientific men have made from a century's study of the subject. I am convinced if it were not for the agitation kept up by these misguided people we would have seen the last of smallpox some years ago.

The decrease in the number of scarlatina and diphtheria cases is most gratifying, both the case incidence and mortality showing a decline.

The number of deaths reported as being caused by measles and whooping-cough is sufficient to warrant physicians, parents and school authorities and local health authorities in maintaining a more careful oversight over these two diseases, which in common parlance it is said we must have sooner or later—an expression of belief the sooner the public are educated out of the better.

The returns as regards enteric fever are not only unsatisfactory, but they bespeak a condition, chiefly as regards drinking water, of which the local health authorities of the Province should be ashamed. Particularly is this statement true of the Town of Fort William, which reports 626 cases with 66 deaths in a population of between seven and eight thousand. As the outbreak in this town is dealt with in a separate communication the only reference to this disease will be to use the figures of Fort William which are correct and show that physicians generally fail to comply with the Public Health Act, and as a consequence we do not know the ravages made by this disease.

In the present instance, admitting the disease at Fort William is a fair type of that present throughout the Province, deducting the 66 deaths in this town from from the 163 reported in the remainder of the Province, there were 97 deaths, which at the same rate as Fort William would represent 920 cases in the rest of Ontario, instead of 207 as shown in the returns, or 713 cases which were not reported to local health authorities.

The necessity of reporting will be seen when it is remembered the chief medium by which the disease is carried is water, and provided laboratory examinations are made of the particular water used by persons suffering from the disease, it is possible in the majority of instances to determine as to the probability of the same being infected or not, and with this knowledge the local health authorities can either prevent the further continuance of the pollution, or if this is impossible prevent its further use. In this manner the outbreak of disease from year to year would be avoided.

Again, I am of the opinion that in many instances mild cases of the disease are treated as "low fever" or "remittent fever," or other fevers with smooth sounding names by physicians, when in reality they are true enteric, and in these instances a blood test would reveal its true character, and thus the spread of the disease would not only be prevented, but lives would be saved. Then again, the very fact that the physician fails to correctly diagnose such cases leads to an increase of the danger to those of the same household or community—no precautions are taken to disinfect the excreta, and the water supply, particularly if it is a well, is more liable to become contaminated or reinfected, and the failure on the part of those in attendance upon the patient to observe particular care in personal hygiene and in the various utensils used by the patient, are also factors in the spread of the disease.

Bearing this in mind, I desire to impress upon physicians the necessity for greater precision in the matter of diagnosis in these low or continued fevers, and would recommend the early resort to the use of the Laboratory in making the Widal test.

Tuberculosis.

I have spoken so frequently in regard to the ravages of tuberculosis and the failure on the part of municipalities to realize their responsibility in each providing by means of dispensary, day camp and sanitarium for the care of those suffering from this contagious disease, that I feel it almost a waste of time to speak further on the subject, particularly when it is apparent the press of the Province and municipal authorities generally, are apparently under the hypnotic influence of "charity," and being in that state fail to realize that the best authorities upon the subject are of the opinion the disease is one beyond the domain of charity, and to be dealt with successfully requires all the efforts of charity, the municipality and the state—each having its place in the great work, but to no one of these classes can the sole control be ceded—the foremost must ever be the municipal, and to this the others must be accessory and contributory.

Remembering, however, that the Government of Ontario offers to assist municipalities in the construction and equipment of sanitoria, and contribute $1.50 per week per patient, by way of maintenance, I feel free to refer to the neglect of this most important subject by municipal authorities.

Of the great white plague it may be truly said in respect to its ravages in this Province and this Dominion, that our condition is similar to that of the Grecian Prometheus, as depicted by Panhasius—"the vulture at his vitals, and the links of the lame, lemnian feasting on his flesh," and the apathy of the municipalities to the cry of the thousands of our fellow countrymen who are suffering from this vulture of humanity, and enduring the prolonged agony consequent upon the tightening and festing links of consumption, receive but scanty consideration from the busy and maddening crowds who throng our busy markets from Atlantic to Pacific—indeed the reply of the municipalities may be likened to the Greek painter's retort to the tortured slave, when with pleading and bloodshot dying eyes, he feebly murmured for mercy.

> "Press down the poisoned links into his flesh,
> And tear agape that healing wounds afresh,"
> So—let him writhe!

For the thousands who die annually in Ontario, but few indeed have been enabled to have their shortened path through this life blessed with a short residence at the three institutions provided in this province by a band of persons who for some years have as a charity been caring for as large a number of tuberculous persons, as their resources would permit.

The municipal authorities of this province have not risen to a due sense of their responsibility in regard to the care of those suffering from this contagious, curable and preventable disease.

In this period of our country's prosperity is there no time for thought and care of this most important question—are stocks and bonds, real estate and commercial enterprises of more importance than -the caring for those of our own flesh and blood who are now subjects of this fell disease, and who sooner or later must ere passing from this busy mart, become a burden and care upon either those of their own household, their relatives, charity, the municipality or the state.

My answer to this question is, the busy world says, "yes" and hurries on hardly taking time to reply, but stop the leading passer by and tell him the cattle of the country are threatened with a severe affliction which during the next few weeks will carry off thousands, and he will stop and heed you, his stocks are threatened, and he may lose tens of thousands of dollars—or the next, and say the silk market is threatened by reason of a disease of the silk worm—or to the wine merchant, that the grapes have been attacked with a particular mould which threatened to destroy the vines—each will become interested and in time will interest others in the result that Governments will heed their cry and give thousands or tens of thousands—and all for what? to satisfy the greed for wealth. Coming down to even more commonplace things, I am of the opinion that more money has been appropriated by the Government of this Dominion and by the several Provincial Governments for the study, prevention, treatment and remuneration of the owners of animals and cattle suffering from contagious diseases in last year, than has been spent by all these authorities put together, since Confederation, for the care of tuberculous human beings.

A pretty state of things that a cow should be of more importance in the eye of the politicians of this country, than a human being, and as a consequence our legislative bodies spend their time in agricultural, commercial, municipal, railroading and electrifying pursuits; too busy to devote even a passing notice upon the health of those to whom they owe even their political existence; failing to be leaders in matters of vital importance to those of their own households, satisfied to be led in channels of commerce and of municipal politics.

Canadian Association for the Prevention of Consumption and other Forms of Tuberculosis.

Having been appointed in conjunction with Dr. R. Bruce Smith, by Order-in-Council, to represent the Government of the Province at the Sixth Annual Meeting of the Canadian Association for the Prevention of Consumption and other Forms of Tuberculosis, I have the honour to report as follows:—

The meeting was held in the City of Ottawa on the 28th and 29th of March last.

The attendance was large, representative delegates being present from nearly all the provinces and territories, and most interesting reports were presented from British Columbia, Manitoba, Prince Edward Island, Montreal, Ottawa and Hamilton.

The work in the two former cities taking the character of a special dispensary with associated nurses who visit the patients, instructing and directing as to sanitary conditions to be observed in their homes, distributing clothing and suitable food where these necessities are required. In Montreal the work is conducted by the Anti-Tuberculosis League; while in the Capital it is carried out under a branch of the Dominion Association, and on somewhat similar lines to those in Montreal.

The Hamilton representatives were able to report on the raising of some $45,000 to be devoted to suitable sanitary buildings.

Dr. Simpson, Chairman Manitoba Board of Health, reported the setting apart of some $25,000 by the Legislature of that Province for the erection of a sanitarium, and already several places had offered free sites for the same.

The Chief Medical Officer of Health of British Columbia reported the accumulating of funds for the purpose of erecting a Provincial sanitarium, but no definite action had yet been taken as to site, etc.

The work of the Convention was carried out chiefly in committees, which were as follows:—

(*a*) Committee No. 1.

Organization and work. To consider the best methods and lines for future development.

(*b*) Committee No. 2.

How can we obviate the prejudice against the erection of hospitals and homes for consumptives, which are frequently regarded as sources of danger to the surrounding community?

(*c*) Committee No. 3.

Care of public conveyances (steamships, railway carriages, street cars, etc.), to prevent the spread of consumption.

(*d*) Committee No. 4.

Inspection of schools and examination of children.

(*e*) Committee No. 5.

House to house visitation, instruction to sufferers, and early diagnosis.

(*f*) Committee No. 6.

Finance.

As the reports of these committees have appeared in the public press, they will not be given here.

One feature of the discussion which followed the report of Committee No. 1 was a resolution that the Association should, through its Council, represent to the Provincial Government of Ontario, and incidentally to the other provinces, that it should erect a provincial sanatorium for all municipalities—the mover and seconder of this resolution expressing themselves that as no municipality had so far availed itself of the promises of the Municipal Sanatoria Act, therefore, the province was to blame and the system as enunciated in the Act was a wrong one—strange to say the resolution was supported by Dr. P. H. Bryce, who, when a member of this Board, was a strong advocate of the principle of municipally owned and controlled sanatoria.

The arguments advanced as well as the resolution were replied to by the representatives of the Province, both of whom pointed out that the Municipal Sanatoria Act was in every way sound and was upon the most advanced lines as laid down by leading authorities throughout the world—and the offer of the Ontario Government was generous and fair both as to initial outlay and annual maintenance, and we felt that the Association had no reason particularly, to refer to Ontario, as this province is the only one in the Dominion which has provided a means whereby municipal sanatoria can be erected and receive provincial assistance and maintenance. It was pointed out by Dr. R. W. Bruce Smith that the suggestion of one or more large Provincial sanatorium for the tuberculous was most undesirable, and he hoped there would never be such erected in this province.

The evening meeting of the first day was held in the Assembly Hall of the Normal School, when Dr. Richer gave a most interesting and instructive lecture on "Some Phases of the Course of Tuberculosis, Its Treatment and Cure,"—the various points of the lecture being illustrated by a series of stereopticon views.

The continued interest of Vice Royalty in the work of the Association was shown by the presence of His Excellency, Earl Grey, at the afternoon session of Wednesday, who spoke encouragingly of the educational efforts of the Association throughout the Provinces of the Dominion.

Before concluding its work a new departure was made in the selecting of Montreal as the next place of meeting.

Sanitation of Cobalt.

The rapid increase in the population of this district consequent upon the discovery of valuable mineral deposits, has necessitated from the outset a sanitary supervision on the part of this Board, owing to the fact of the district being unorganized.

With a view of ascertaining the exact conditions and the particular dangers incident to camp life and the erection of a large number of temporary buildings, Dr. Bell, Medical Inspector of the Board, was requested to visit and report, as early as March 6th, 1905, when there were only three camps in operation. Since that date he has repeatedly visited the district, enforcing the sanitary regulations of the Board as regards camps in the unorganized districts—even going so far as to prosecute in one instance a company, the manager of which refused to comply with the regulations. As a result of the Inspector's work, all the mining companies provided medical attendance and hospital accommodation for their employees, and notices were issued in the name of this Board ordering "all water" to be boiled for drinking purposes, and the Provincial constable was instructed to report any failure on the part of the inhabitants to observe the regulations of the Board.

In March last Dr. Amyot was sent to Cobalt upon my receiving word that ice was being cut for domestic purposes, from Cobalt Lake, and as a result of his visit the cutting of ice from this lake was discontinued and a good supply obtained.

Since Dr. Amyot's visit the municipality of Coleman has been formed, which removes the camps from the direct supervision of this Board, and places the sanitary arrangements of Cobalt and the township generally, in the hands of the Local Board of Health.

I am pleased to inform this Board that the Honourable the Provincial Secretary has appointed Mr. S. Scott as a temporary sanitary inspector, whose duty it will be to assist the local authorities in the enforcement of the sanitary laws of the province. Already good work has been done, much however remains to be done, and in a short time two hospital tents, with beds, etc., will be forwarded to Cobalt to be used in case of any outbreak of a contagious character—and there is already under consideration the securing of a pure water supply for immediate use.

Enteric Fever at Fort William.

As intimated in my remarks on this disease in the early portion of my report, there has been a very severe outbreak of enteric fever at Fort William duing the quarter—626 cases being reported with 66 deaths.

In order that there may be no misunderstanding in regard to the action taken by your Secretary upon his suspicions being aroused that the water supply of the town was polluted, I beg to submit the accompanying correspondence:—

The first, "A," dated Jan. 5th, 1905, is addressed to Dr. Birdsall, M.H.O., and in it a statement is asked for a monthly record of enteric cases with the opinion of that officer in respect to the cause of the outbreak.

The second, "B," dated Jan. 25th, 1905, is addressed to Mayor Rutledge, in which the request made on Jan. 5th was repeated.

The third, "C," was written Feb. 17th, 1905, and is addressed to A. McNaughton, Town Clerk, the request being made for plans, etc., *re* the sewers emptying into Kamanistiquia River above the water intake. This letter was sent just after Dr. Bell's letter had been received stating the result of his inspection made Feb. 13th, and before that officer's return to the city.

It will be noted that no reply was received to any of these communications, although it was felt by your Secretary that the subject was of importance to the inhabitants of Fort William.

The report of Dr. Bell was forwarded to the Town Clerk on April 27th, 1905, at the same time as a copy was sent to the C. P. R. officials, but no acknowledgment of its receipt has been received.

The next communication, "D," was that of Sept. 8th, 1905, to the Town Clerk, on receipt of the returns regarding contagious diseases for the month of August. As a result of this letter we find that "Notice" was issued by the local Board of Health stating the desirability of the citizens boiling all water used for drinking purposes. See "E."

On October 13th, a letter was received from Dr. Birdsall—"F"—which indicates that officer had read Dr. Bell's report, at least that portion referring to the C.P.R. supply, and further, the reports of Dr. Amyot, "G," dated Sept. 26th, 1904; Oct. 20th, 1905, and Jan. 27th, 1906, clearly indicate that that officer noted the unsafe condition of the waters sent for analyses—the fact is noted it is unsafe without being boiled.

With a study of this correspondence I am sure the Board will be satisfied that sufficient interest was manifested by your officers in the water supply of the town; while on the other hand it is evident that nothing was done by either the Mayor, the M. H. O., or the Town Clerk of Fort William to give the information asked for or to enquire into the outbreak of 1904. Had this action been taken, I am of the opinion the epidemic of 1906 and the attendant loss of 66 lives might have been averted.

To show the feeling which exists in the mind of Dr. Birdsall, M.H.O., as regards the laboratory procedure in respect to the analyses, I have to submit for your consideration correspondence with that officer, "H," "I," also Dr. Amyot's reply, "J," as to the remarks contained in "H," and a second letter from Dr. Birdsall which speaks for itself.

In conclusion I desire to express the sincerest regret for the unfortunate epidemic which has occurred in this rapidly growing town, but am confident the fault is not chargeable to this office or Board. On the other hand, I feel certain the inhabitants of Fort William, who have been called upon to suffer so severely, cannot free its officials from blame, particularly when the foregoing facts are made public.

"A."

Toronto, Jan. 5th, 1905.

Dear Doctor,—Will you kindly let me have a statement of the number of typhoid fever cases reported in Fort William for the year 1904, giving me the same by months.

I would like very much to have your opinion regarding the cause of the outbreak. When in Rat Portage some two or three months ago my attention was directed to the fact that some twenty-two cases were in the hospital, twenty-two of whom were employees of the C. P. R., and that they were either firemen or front-end brakemen who were likely to drink of the water as supplied to the engine. Kindly let me know your experience in this matter.

Wishing you the compliments of the season.

Believe me, yours truly,

Chas. A. Hodgetts,
Secretary.

Dr Birdsall,
Fort William, Ont.

"B."

Toronto, Jan. 25th, 1905.

Dear Sir,—I beg to acknowledge the receipt of your favor of the 19th inst., and send you by this mail booklet descriptive of a Destructor which might be used in your town. Should you desire any further information I shall be pleased to give it.

I note by the returns for the past summer that there has been quite an outbreak of typhoid fever in Fort William, and would like very much if you would have the Medical Health Officer furnish me with a report regarding the same, giving the number of cases either by weeks or months, and also stating what he thinks caused the origin of the outbreak.

Believe me, yours truly,

Chas. A. Hodgetts,
Secretary.

E. S. Rutledge, Esq., Mayor,
Fort William, Ont.

"C."

Toronto, Feb. 17th, 1905.

Dear Sir,—I have just received a report from Dr. Bell, who has recently been in your municipality, and regret to learn that your board has not enforced the Act in so far as it relates to the notification of all cases of typhoid fever, and I would request that you immediately instruct physicians in the municipality to comply with the Act and provide them with the necessary blank forms if they have not already been so supplied.

In view of the fact that sewers empty into your river above the intake pipe, I would request that you at once forward me plans showing the exact position of the sewer outlet and also of the intake pipe, with a statement of the number of houses, factories, etc., connected with the sewerage system, and also the number of houses using the public water supply.

Thanking you in anticipation of an early reply,

Believe me, yours truly,
CHAS. A. HODGETTS,
Secretary.

A. McNAUGHTON, ESQ., Town Clerk,
Fort William, Ont.

"D."

TORONTO, Sept. 8th, 1905.

DEAR SIR,—I find in your report for the month of August, fifteen cases of typhoid with one death. I would strongly urge your Local Board of Health to notify the public to boil all drinking water; and further, that some steps be taken to prevent the pollution of the river above your intake pipe; otherwise, much loss of life and danger to health will occur before the contemplated system of water works is in operation.

Kindly let me know what action has been taken by your board.

Believe me, yours truly,
CHAS. A. HODGETTS, M.D.,
Deputy Reg.-General.

A. McNAUGHTON, ESQ., Div. Registrar,
Fort William, Ont.

"E."

CHARLES A. HODGETTS, M.D.,
Deputy Reg.-General, Toronto.

FORT WILLIAM, Sept. 30th, 1905.

DEAR SIR,—In reply to your favor of the 8th inst., relating to the water supply of this town, would say that I had the matter you spoke of, that is, boiling the drinking water, brought before the Board of Health, and also the council, and I was instructed to have a notice placed in both daily papers here calling attention to the fact that possibly the water might be polluted and advising that before using, it should be boiled.

I send you herewith copy of the notice that appeared in both papers in this town.

In my return of number of cases of typhoid in town, would say that one doctor reported all cases where the symptoms were typhoid, our Medical Health Officer thinks this should not be so, as he says some cases do not mature to the typhoid stage, and thus leaves a false impression; on the other hand there were some deaths reported where the causes were directly due to typhoid fever, but not so reported. I suppose, however, it is hard to get at the proper way of reporting these cases, and I will have to take them just as they appear before me.

Yours truly,
A. McNAUGHTON,
Sec. B. of H.

NOTICE.

It is desirable in the interests of good health of the citizens of Fort William, that all water used for drinking purposes should be boiled in order to destroy any possible germs of bacteria.

By order of the Board of Health.

A. McNAUGHTON,
Secretary.

FORT WILLIAM, Sept. 22, 1905.

"F."

FORT WILLIAM, Oct. 11th, 1905.

C. A. HODGETTS, ESQ.,
Sec. Prov. Board of Health, Toronto.

DEAR DOCTOR,—Kindly forward me six sample water bottles.

Re Light House Water Supply:—Your Dr. Bell in his report noted this defect which I had described in my reports to council and Board of Health. The water and water tap and pipes are C. P. R. service, and they procure this water at the freight shed, the intake pipe being only a few feet from mouth of our pumping station sewer outlet. I have repeatedly asked council, Board of health and Water Commission to forthwith cut off this service and instal town service. Board of Health refers the matter to council—council to Water Commission, and Water Commission to Board of Health. Recently Board of Health referred the subject to me for disposal and I advise the immediate cutting of the pipes where they illegally cross our streets. Council and Commission contend that we cannot interfere with Dominion Government works and buildings. I contend that neither Dominion Government nor any other power or railway company may supply impure sewerage to any of our citizens as water for domestic use contrary to the Provincial Health Act. Kindly advise me how to immediately remove this danger spot. At present no one in town will act and the only way will be to go personally and cut off the pipes. Yours truly,

W. W. Birdsall, M. H. O.

"G."

Copies of Letters to Dr. Birdsall of Fort William *re* Water Supply of Town.

Dr. W. W. Birdsall, M.H.O.,
Fort William.

Sept. 26, 1904.

Dear Doctor,—On examination both of the waters sent by you show infection with colon bacilli and should be regarded with suspicion.

Yours truly,

John A. Amyot.

Dr. Birdsall,
Fort William.

Oct. 20, 1905.

Dear Doctor,—Your two specimens of water received on Oct. 18, 1905. No. 39 from "town service" does not show any infection with harmful bacteria, whilst the other, also from the "town service," in bottle No. 97, shows infection with Colon bacilli, intestinal bacteria. This means that the town water is unsafe without a previous boiling.

Yours truly,

John A. Amyot.

Dr. Birdsall, M.H.O.,
Fort William.

Jan. 27, 1906.

Dear Doctor,—The specimen of water received from you on Jan. 15th from the "town pumping system" shows some chemical pollution, but is especially dangerous from containing both colon bacilli and streptococci. There is evidently sewage pollution here and probably of recent occurrence. I mean the sewage is probably fresh.

Yours truly,

John A. Amyot.

"H."

Dr. Hodgetts,
Sec. Prov. Board of Health,
Toronto, Ont.

Fort William, Ont., Feb. 23rd, 1906.

Dear Sir,—We are to-day sending to the laboratory of the Provincial Board of Health three separate and distinct samples of water for anaylses. Kindly wire the result to me at my expense as we desire the water for immediate use for 8,000 people, among whom about 360 cases of typhoid have been reported by physicians to me since Feb. 1, 1906.

Samples of water collected personally by me and assisted by the water commissioners personally and at considerable trouble and time on Feb. 7th, 1906, could not possibly have been carefully analysed, and the report received by me on Feb. 16th, 1906, in a letter directed to Port Arthur and purporting to contain anaylses of water forwarded by Dr. W. W. Birdsall, M. H. O., Port Arthur, gave result of five samples as being identically alike in every respect, all contained bacilli colon and were pronounced dangerous. Dr. C. N. Laurie, M. H. O., of Port Arthur, about same time, received report that the samples were absolutely pure and contained no harmful bacteria. I am interested in Fort William water and as Medical Health Officer of Fort William only am again forwarding samples and desire a careful analyses of same. Samples are also being sent to other laboratories for check analyses, as the former samples could not possibly have analysed alike unless all were dumped into one vessel and a running guess given as result. Yours truly,

W. W. Birdsall, M. H. O.

"I."

TORONTO, March 3rd, 1906.

DEAR DOCTOR,—In reply to your favor of the 23rd ult., *re* water analyses, the same was referred to Dr. Amyot with the request that he furnish me with a statement regarding the examination of the water referred to, by you, as also reports.

I beg to enclose you a copy of the statement made by the Doctor regarding the same. Owing to a clerical error you were furnished with a report of the analyses of five samples, three of which were received from yourself and two from Dr. Lawrie, Port Arthur. These samples were received on the same date, Feb. 10th, and as stated through a clerical error, the report upon the five samples was sent you, but a study of the report would easily enable you to pick out the samples forwarded from Fort William as distinct from those sent by Dr. Lawrie from Port Arthur.

Regarding your imputation that all five samples were dumped into a common vessel and examined, Dr. Amyot very properly refutes it, and he also explains that there was plenty of time after the receipt of the specimens to furnish you with a report, so your criticisms regarding the laboratory are, in my opinion, not only uncalled for, but are entirely wrong.

Dr. Amyot's explanation regarding the chlorine content, is also a very correct one.

In reference to the samples which you state were sent on the 23rd, Dr. Amyot informs me he will forward you report to-day, under the circumstances he does not deem it wise to telegraph his report as it is quite evident the same might be misunderstood.

I trust Dr. Bell has enquired into the serious condition of affairs at Fort William and will write me at an early date.

Regarding the analysis of cream soda, this is a matter that is purely medico-legal, and one that does not fall directly within the province of the work of this Board, and in future such requests for analysis should be made by you as Coroner through the Crown Attorney.

Yours truly,
CHAS. A. HODGETTS, M.D.,
Secretary.

DR. W. W. BIRDSALL,
Fort William, Ont.

"J."

LABORATORIES OF THE PROVINCIAL
BOARD OF HEALTH,
TORONTO, March 2nd, 1906.

MY DEAR DOCTOR HODGETTS,—With reference to Dr. Birdsall's plaint—

On Feb. 1st, 1906, a sample of water and one of ice were received from Mr. McCutcheon of Port Arthur. On Feb. 3rd, in answer to a telegraphic request from him, the following telegram was sent with reference to these samples: "Neither ice nor water show any infection. Bottles are being sent for water from ice source." On Feb. 5th, a written report was sent to him on the same samples with following comment: "Neither of these specimens show chemical pollution nor infection with harmful bacteria."

On Feb. 10th and at the same time three samples came from Dr. Birdsall of Fort William, and two from Dr. Lawrie of Port Arthur. Analyses were begun immediately on all five, a fixed rule of the laboratory, "Don't wait for letters, begin at once."

By mistake on our working sheet all five specimens were entered under Port Arthur. The results were reported to Dr. Birdsall. Dr. Lawrie's specimens were specified in the column, "Where collected from" of the report.

The mistake in reporting all five specimens followed from this and was a clerical error. Dr. Birdsall, when he received the report, could not but have known this. His publication of the portion belonging to Port Arthur was hardly all square.

As for the analyses, I did them myself and was as careful as I could be, knowing in a general way the situation as to typhoid fever in the district. All five specimens showed colon bacilli, and this is not strange. Fort William waters were from the river, a big camp, and all the sewers draining into it. The Port Arthur waters were from inside the "breakwater." As to the chlorine content, Lake Superior shows three per million as a rule. The river, if it were pure draining the district it does, should show one or at most two per million, but with the sewage going into it there is nothing strange in that all three should show an advance to three.

I am no more responsible for the bad water than the Doctor would be that a chance patient was suffering from smallpox.

The water is bad and there will be no abatement of the typhoid fever in Fort William until the condition is corrected. Other samples we have had from there show the same condition as these last, and they know it. Why don't they face the question?

Yours respectfully,
JOHN A. AMYOT.

Vaccination—The Necessity for a Campaign of Education.

The recent agitation against vaccination in the City of Toronto, which city seems to contain within its corporate limits most, if not all, the faddists in the province, has, in my opinion, made prominent the fact, that the education of the public as to the advantages of vaccination and re-vaccination, has been apparently neglected by those responsible for their instruction: and in these words of censure I would not altogether free the teachers in the medical schools of the Province, for in my experience the knowledge possessed by the bulk of medical students as to the necessity for the continuance of this practice and the carrying of it out on aseptic lines is most meagre.

The presumption of a body of faddists in endeavouring to inform the public and the medical profession upon a subject about which they know nothing practically is patent to all. In the main their knowledge is simply the result of the imbibition of distorted truths, half facts, and false deductions on the part of a very small minority of scientists, who in like manner are faddists, but certainly deserving of severe censure from health authorities generally, by reason of the fact that their scientific knowledge has been directed into channels which have and will in the future result disastrously for the public good.

In view of the large amount of literature issued by the opponents of vaccination, I deem it my duty in the public interest to direct the attention of the Board to the necessity for the issuance in pamphlet form of an article upon the question for popular distribution, and for this purpose beg to submit to the Board the accompanying pamphlet with illustrations. Trusting the same will meet with your approval. (See following article as approved by the Board.)

In conclusion, I would refer to the great sanitary difficulties which surround the recent calamity or series of calamities in the city of San Francisco—any one of which would be serious enough and would make great demands on the resources of sanitarians to successfully meet them. But the chaotic conditions which exist—sewers broken, leaks in water pipes and mains, damaged house connections will require considerable care and much labor to set right. But what can be said of the sudden precipitation of 300,000 persons into camp life of a primitive character at first—even with a semi-military organization which is rapidly being arranged—the difficulties are enormous for even in military camps kept in the highest conditions as regards sanitation, troops are often attacked with disease incident upon such a life. To prevent diseases such as diarrhoea, dysentry and enteric will tax the efforts of those in charge of the sanitary arrangements in the unfortunate city, for the combination of circumstances of changed conditions of living, low and altered diet, exposure to sun and rain with extremes of heat and cold, such as occur in that State at this season of the year, have possibly never before presented themselves in modern history at least, and sanitarians will await with much interest the result of their work for valuable lessons will no doubt be learned therefrom.

A Descriptive Article on Vaccination.

BY CHAS. A. HODGETTS, M.D., L.R.C.P., LOND.
Sec. Provincial Board of Health and Chief Health Officer of Ontario.

The casual remark made by a farmer's daughter, in the hearing of a young medical student, upon being informed of an outbreak of smallpox in the district where she resided, "I cannot take that disease for I have had cowpox," was sufficient to impress the mind of Edward Jenner and lead him to devote years of patient study and careful experiment, which culminated in his being able to confidently state to the world that vaccination gave immunity from that loathsome, malignant, disfiguring and deadly disease, smallpox, of which, up to that time no means had been found to prevent its spread. A statement which more than a century of experience in the civilized countries of every continent has been established deeper and deeper with each passing decade; indeed, it may be said, the chief, if not the only opposition, of the practice has, strange to say, come from those who may be considered fellow-countrymen of this world's benefactor; a modern instance of a prophet not being without honor save in his own country and among his own kinsfolk.

As to the beneficial results of this discovery, which was freely given by Jenner to the world, the following outline of the effects of vaccination upon the ravages of smallpox will plainly show.

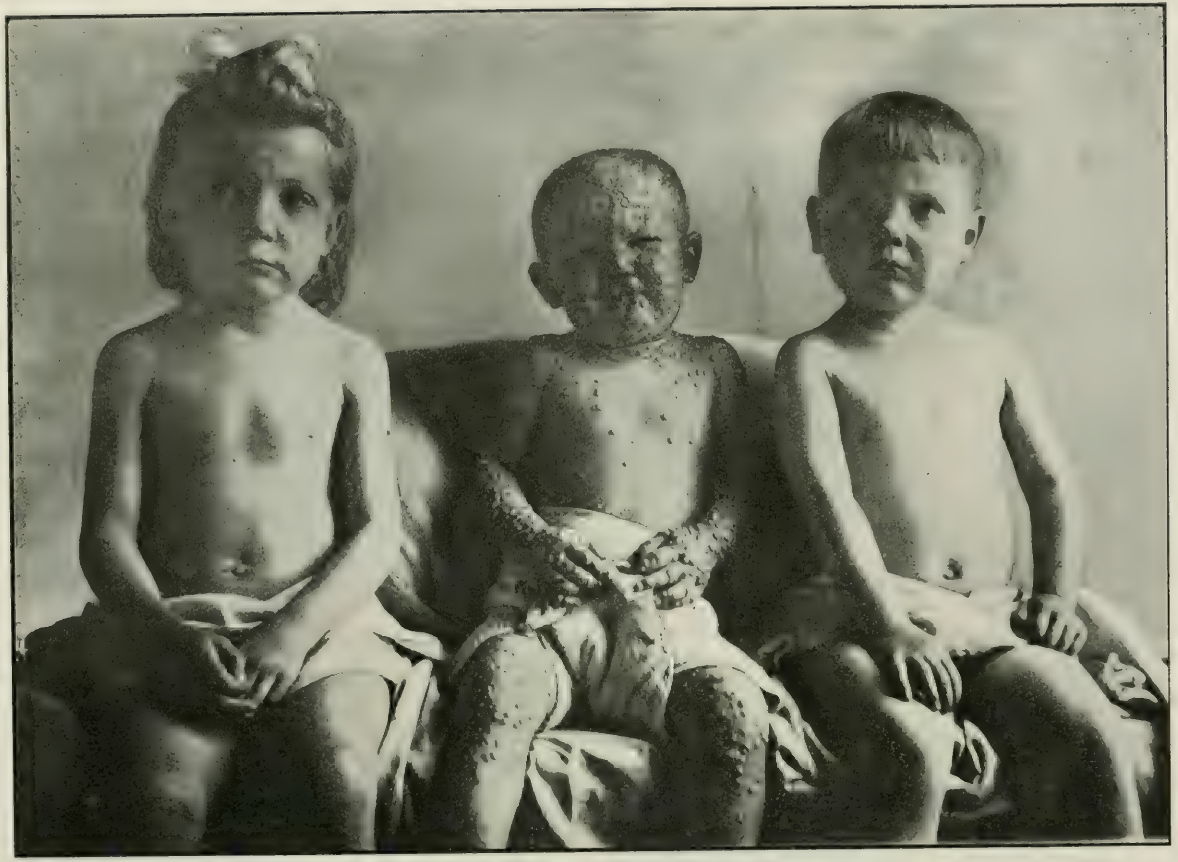
The information is collated from the writings and experiences of practical workers in this field of preventive medicine, those who have had special opportunities to personally treat large numbers of cases of smallpox and perform general vaccination, and carry out the work incident to outbreaks of the disease. None of them are scientific theorists, faddists, or juggling statisticians. With them it is a case of facts founded on experience, which together are stronger than fiction based on false theories.

Early History of Smallpox.

Without referring to the early writings upon the subject of smallpox, from which, however, it is quite evident the disease prevailed in many parts of Asia and Africa long before the beginning of the Christian era, accompanied with miseries of the worst kind, we will pass on to the year 581 A.D., when the disease was epidemic in southern France and northern Italy, as described by Gregory, of Tours, whence it spread rapidly in all directions, invading Iceland in 1341 A.D. During the wars of the Crusades, epidemics of the disease in a malignant form were numerous.

Smallpox in the Eighteenth Century.

It was, perhaps, most widely distributed and malignant in form in Europe during the eighteenth century, no country was free from the pestilence; at least a tenth of all the deaths occurring at that time were due to it. In France alone 30,000 died annually, and nearly a like number in the then Kingdom of Prussia. It was the common experience then as now (amongst the unvaccinated) that the disease was no respector of persons—the high and the low, the rich and the poor, the suckling child and decrepit age, all the groups were called upon to offer victims to this moloch of disease. In all classes of society were found those seared, scarred or maimed for life as the result of it.



Three Members of a Family brought to the Isolation Hospital with their Mother who was suffering from Smallpox.

The child in the centre was *unvaccinated*, the other two had been vaccinated a year before because of the school vaccination requirements, the two vaccinated remained in the smallpox wards several weeks and never contracted the disease.

From "Welch and Schamberg on Acute Contagious Diseases.'

It is estimated that during this century only five out of every hundred persons went through life without being attacked by it. The estimated number of deaths in Europe from smallpox (Juncker) was 400,000, while the " Bills of Mortality " for London alone, from 1761 to 1800, show the deaths in that city from smallpox to have averaged each year 19,425, and according to Lettsom, most children in that city had the disease before the seventh year of life.

Many lengthy tables* could be given showing the deaths which happened yearly in the countries and cities of Europe during the latter portion of the 18th and early years of the 19th century before vaccination was introduced. As they can be found in any standard work upon the subject they will not be given here, suffice to say that their correctness is unquestioned.

The following data, however, is most interesting, as indicating the marked contrast of the ravages of smallpox in pre-vaccination periods when compared with those years after its introduction in various cities and countries. In studying these figures it must be remembered that vaccination was purely a voluntary matter in the years immediately following its introduction, and even when made compulsory some time must necessarily elapse before the majority had been vaccinated, hence must follow a gradual decrease in the death rates from smallpox.

Smallpox in Sweden.

In Sweden vaccination was made compulsory in 1816, but, as a result of voluntary vaccination before that date, it is found the average yearly death rate per million of the population for the decade 1802-1811 was 623, while in the next decade, 1812-1821, it fell to 133, as against a yearly average of 2,050, for the twenty-eight years immediately preceding vaccination.

Perhaps the most striking figures presented as showing the beneficial effects of vaccination are those of Sweden, as the figures are obtainable from three distinct periods, viz., pre-vaccination, permissive vaccination, and compulsory vaccination. The mortality in each case is per million lives:—

(*a*) Pre-vaccination............ 1774-1810, average 2,045, for 28 years.
(*b*) Permissive vaccination...... 1802-1816, " 480, " 15 "
(*c*) Compulsory vaccination..... 1817-1893, " 155, " 77 "

University of Prague Report.

Again, in official figures of the University of Prague for seven years preceding vaccination, viz., 1796-1802, out of an average population of 3,039,722, it is found that one-twelfth of all the deaths were due to smallpox, or 7,663 out of 94,955 deaths from all causes; while for the twenty-four years from 1832 to 1855 (inclusive), out of an average population of 4,248,155, only 287 persons, averaged annually died from smallpox out of an annual average of 131,412, or 1 to 457.

In Copenhagen and Berlin.

Similarly in Copenhagen, for the fifty years, 1751 to 1800, the smallpox death rate was 3,422, while for the first forty years of vaccination it averaged only 286. In Berlin, during twenty-four years preceding vaccination, the death rate was 3,422, and for the forty years succeeding vaccination 176 from smallpox.

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*Paper by Mr. John Senior, 1857.

Vaccination had Reduced Smallpox by Middle of Nineteenth Century.

So general had vaccination become by the middle of the nineteenth century, the fatality had been reduced in Copenhagen to one-eleventh of the pre-vaccination rate; in Sweden to nearly one-thirteenth: in Berlin to one-twentieth; while in London the smallpox deaths by decades both before and after the introduction of vaccination were as follows:

Before Vaccination.

Decade.	Deaths from Smallpox.
1761-1770	20,434
1771-1780	20,923
1781-1790	17,867
1791-1800	18,477

After Vaccination.

Decade.	Deaths from Smallpox.
1801-1810	12,534
1811-1820	7,858
1821-1830	6,900

Many similar tables could be given in proof of the fact that with the introduction of vaccination came a decrease in the number of deaths, but to extend the truth is quite unnecessary.

Vaccination has Changed Age Incidence.

It may be both of interest and importance to the question to illustrate the fact, that vaccination has changed the age incidence of smallpox. The figures are those of Warrington, in which epidemics of smallpox occurred in 1773, when the population was 8,000, and 211 deaths happened; again in 1893, when the population was 54,084, of whom 53,645 were vaccinated.

The ages are as follows:—

	1773.	1893.	
	All unvaccinated.	Vaccinated.	Unvaccinated.
Under one year	49	0	8*
1 to 2 years	84	0	1
2 to 3 years	33	0	0
3 to 4 years	18	0	1
4 to 5 years	15	0	1
5 to 6 years	4	0	0
6 to 7 years	2	0	0
7 to 8 years	2	0	0
8 to 9 years	4	1	1
9 to 15 years	0	1	1
15 to 20 years	0	1	2
20 to 30 years	0	10	4
30 to 60 years	0	24	5
Over 60 years	0	1	0
	211	28	24

The lesson taught here is that in the 1773 outbreak all the deaths were under ten years of age, and nine-tenths under five years of age; while in 1893 not a death occurred under eight years of age, and it is a fact that not a vaccinated child under eight years of age contracted smallpox.

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*Under one month.

Report of British Royal Vaccination Commission Shows a Marked Change in Age Incidence.

The following table from the Report of British Royal Vaccination Commission :—

Smallpox in Children of the Age of 1 to 10 years.

	Vaccinated.	Unvaccinated.
Attacks	570	1,235
Deaths	16	375
Fatality, per cent	2.8	30.3

shows the great difference between the death rate of children under ten years of age in the two groups

Again, quoting from the report of the same Commission, the statistics of the following six recent epidemics in that country, viz. :—

Dewsbury	1891–2	Warrington	1892–3
Leicester	1892–3	London	1892–3
Gloucester	1892–3	Sheffield.	

Of 11,065 cases reported, there were 1,283 deaths, or 11.5 per cent., as follows :—

	Vaccinated.	Unvaccinated.
Cases	8,744	2,321
Deaths	461	822
Per cent	5	35.4

The deaths amongst the unvaccinated being seven times greater than in the vaccination groups ; while of this same group, of the children under ten years of age, the returns are as follows :—

Children under 10 Years of Age.

	Vaccinated.	Unvaccinated.
Cases	589	1,449
Deaths	16	523
Per cent	2.7	36.

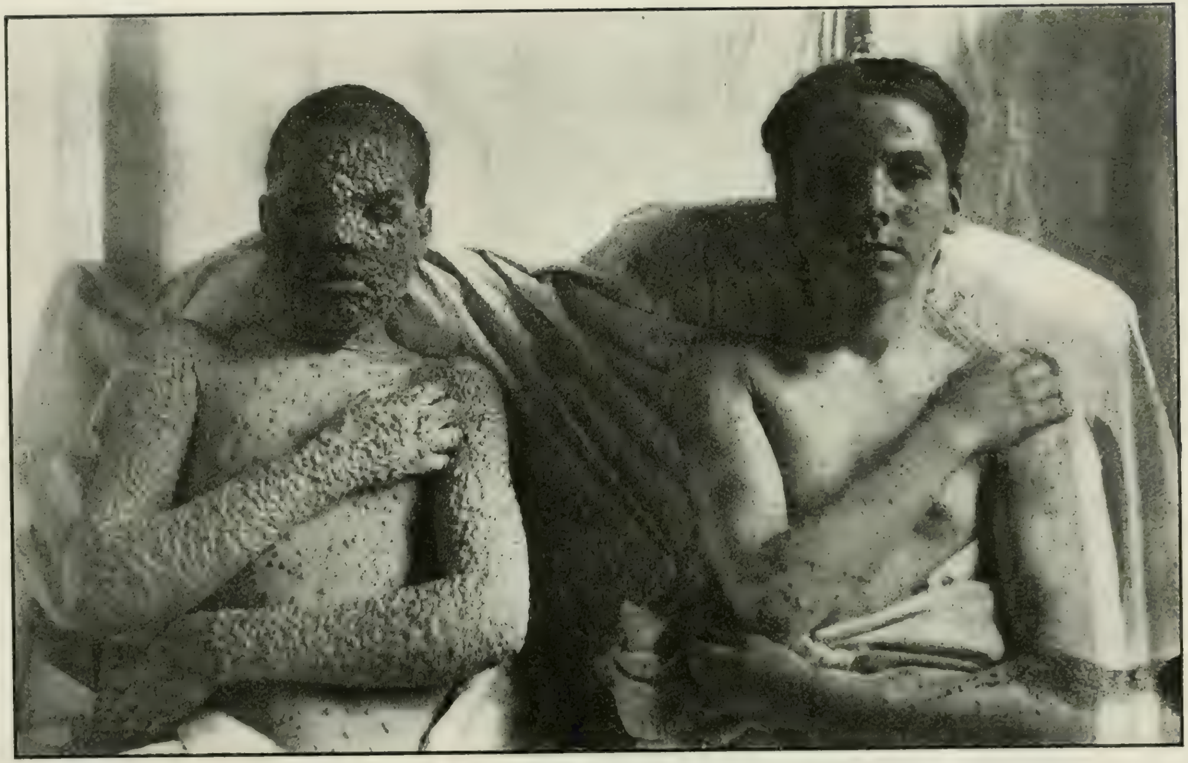
In this group the ratio standing as one to eighteen in favor of vaccinated children.

Facts of Leicester Experience, 1892-3.

In this connection a short statement may be made in reference to the much-vaunted Leicester experience of 1892-3. The facts of which are briefly as follows :—

"Two vaccinated children were attacked with smallpox, neither of whom died. Of unvaccinated children of the same age period 107 were attacked, of whom 15, or 14 per cent., died. Over 10 years of age, 197 vaccinated persons were attacked, of whom two died, or one per cent. Of unvaccinated persons over ten years, 51 were attacked, of whom four, or 7.8 per cent. succumbed."

Where in these figures is there anything to disprove that vaccination is a life saver ?



TWO SISTERS SUFFERING FROM SMALL-POX.

The one on the right, aged 14, was successfully vaccinated in infancy ; she contracted a mild modified small-pox and recovered without any scarring. The other, *unvaccinated*, developed a severe small-pox, finally recovering, although considerably pitted.

From "Welch and Schamberg on Acute Contagious Diseases."

Influence of Vaccination on Attack Rates in Children.

Passing from the facts and figures proving the death rate of smallpox to be lower in the vaccinated than the unvaccinated, it will be interesting to consider the influence of vaccination on the attack rate, and for this purpose the returns of five recent outbreaks are given :—

	Attack rate under 10 years of age.		Attack rate over 10 years of age.	
	Vaccinated.	Unvaccinated.	Vaccinated.	Unvaccinated.
Sheffield	7.9	67.6	28.3	53.6
Warrington	4.4	54.5	29.9	57.6
Dewsbury	10.2	50.8	27.7	53.4
Leicester	2.5	35.3	22.2	47.6
Gloucester	8.8	46.3	32.2	50.

The attention of the reader is directed in this table to the lessened liability to attack of smallpox among children under ten years of age, that is the ages nearer to the date of the first or primary vaccination, than in those of older age, and if further proof of this fact is needed, the following, extracted from the British Royal Commission Report is given, the epidemic dealt with being that of Sheffield.

Sheffield Attack Rate.

Vaccinated population	268,397	Unvaccinated population	5,715
Attacked by Smallpox	4,151	Attacked by Smallpox	552
Per cent	1.55	Per cent	9.7
Vaccinated children under 10	68,236	Unvaccinated children under 10	2,259
Attacked by Smallpox	353	Attacked by Smallpox	228
Per cent	0.5	Per cent	10.1
Vaccinated 10 years and up	196,905	Unvaccinated persons 10 years and up	3,429
Attacked by Smallpox	3,774	Attacked by Smallpox	322
Per cent	1.9	Per cent	9.4

Lesson Taught Regarding Beneficial Effects of Vaccination.

Having so far considered simply the effects of what is known as primary vaccination, *i.e.*, the first successful vaccination of an individual by bovine vaccine, some consideration will be given to revaccination statistics, but before doing so it may profit somewhat if the reader is reminded of the lesson learned, viz., *Successful (primary) Vaccination lessens both the Incidence and the Mortality of Smallpox.* The following figures will prove that those successfully revaccinated are less frequently attacked with smallpox than those only once vaccinated.

Figures of Results of Revaccination.

In Sheffield (1887), of 64,431 revaccinated persons, 27 were attacked, with one death, the attack rate being 0.04 per cent.

In Leicester (1892-3) in a group of 133 houses, with 842 inmates, 141 persons were attacked and of the 84 revaccinated inmates only one developed smallpox. Again, in 60 houses, with 392 inmates, 179 were attacked, and of the 31 revaccinated, 5 developed the disease.

In Warrington (1892-3), of 64 revaccinated inmates of infected houses eight, or 12.5 per cent., were attacked, while in the same houses were 41 who had primarily had smallpox, of whom five, or 12.1 per cent., had a second attack of smallpox, and it is to be noted no deaths occurred among either of these two groups.

Compulsory Revaccination in Germany.

The introduction of compulsory vaccination into Germany was largely brought about by the great difference vaccination and revaccination produced in the German army in respect to smallpox, as compared with the results in the army of France, which was but poorly vaccinated. A comparison of the mortality from smallpox since 1875 in the five large German cities compared with four large cities outside of that country is most instructive, as showing the difference in death rate between vaccinated and unvaccinated cities.

Revaccinated German Cities Lower Death Rate Than Those of Other Unvaccinated Cities.

During the first decade after the introduction of revaccination (1875-1884) there died from smallpox on a yearly average per 100,000 inhabitants :—

Berlin	only 1.16	persons.
Hamburg	“ 0.74	“
Breslau	“ 1.11	“
Munich	“ 1.45	“
Dresden	“ 1.03	“

While in the same time the rates were :—

Paris	26.24	persons.
St. Petersburg	35.82	“
Vienna	64.90	“
Prague	147.90	“

The figures show the rate of mortality from smallpox in German cities is extremely small as compared with Paris, St. Petersburg, Vienna and Prague.

From a recent communication, 1896, of the German Imperial Board of Health to the Reichstag, we learn that for the years 1886-1891 the annual death rate from smallpox throughout the Empire averaged 126, and that only 2 3 persons per million inhabitants from 1889-1893 died from the disease; while calculated in the same way the French cities show a death rate per year 14.7 persons; Belgium, 252.9; Austria, 313.4; Russia (1891-1893) of 836.4. In other words if the mortality of Germany had been as great as in these countries, there would have been (instead of only 126) no less than 7,321 deaths.

Comparison with Vaccinated Army.

While vaccination was enforced in the German Army, it must be remembered the law of compulsory vaccination throughout the empire was not passed until April 8th, 1874, hence a comparison is possible as between the nation and the army. During 1871 there were 59,839 deaths from smallpox in the whole country, as compared with 459 deaths in the entire army domiciled both in Germany and France. The figures, however, are still more convincing in favor of vaccination when a comparison is made between the army and the City of Berlin, whose population of 826,341 was much smaller than that of the army, the deaths from smallpox in the city being 5,508, or twelve times as many more than in the vaccinated army, although the latter was numerically larger.

Again, Germany affords a striking proof of the benefits which followed the compulsory enactment of 1875; previous to this date viz., in 1871-2 the death rate per 100,000 was 243.2 and 262.67 respectively; while in the years from 1875 to 1886, the average yearly mortality per 100 000 was 1 91 the maximum being 3.6 in the year 1877.

Again in 1897 there were but five deaths from smallpox, in a population of fifty-four million people.

Returning again to army statistics, a comparison may be made, between the vaccinated army of Germany, and the imperfectly vaccinated armies of Austria and France, and in considering these figures it must be remembered that the army of Germany was the largest numerically.

Number of Cases of Smallpox.

German army, 1875-1887	148 men.*
French army, 1875-1881	5,605 men.
Austrian army, 1875-1886	10,238 men.

Table Showing Counties with Compulsory Vaccination Laws are First Free from Smallpox.

But what are the facts and figures when we compare the returns of smallpox in the different European countries. The figures in the table bespeak the facts, that the countries having the strongest vaccination enactments suffer the least from smallpox, and they also enunciate the truth, that without vaccination, smallpox is and must be regarded as a scourge and a great destroyer of human life.

In sixteen countries 346,520 persons were sacrificed to smallpox, and of this total 275,502 occurred in Russia. The most of these deaths might have been prevented by vaccination.

Smallpox in Sixteen European Countries 1893-97.

——	Population.	Averages yearly mortality per million.	Deaths from Smallpox.
Germany	52,042,282	1.1	287
Denmark	793,356	0.5	2
Sweden	4,894,790	2.1	41
Norway	2,045,900	0.6	5
England and Wales	30,389,524	20.2	3,066
Scotland	4,155,886	12.3	256
Ireland	4,580,555	9.9	226
Switzerland	3,032,901	5.1	78
Netherlands	4,797,249	38.7	929
Belgium	6,419,498	99.9	3,208
French States	8,253,079	90.2	3,721
Russian Empire (including Asiatic Russia)	118,950,400	436.2	275,502
Austria	23,000,000	99.1	11,799
Italy	31,007,422	72.7	11,278
Spain	10,596,649	563.4	23,881
Hungary	18,234,916	134.3	12,241

Beneficial Results of Vaccination in Schools in England.

One of the latest examples which illustrates the beneficial effects of vaccination occurred in a school at Ossett near Wakefield, England, in the fall of 1904. On October 27th, the master observed a girl aged 11 in class room A, class standard IV, with a suspicious rash on the face and hands. The M. O. H. was immediately notified and he diagnosed smallpox and removed the girl to the hospital. There evidently had been considerable exposure and the results of the sowing of the seed upon vaccinated and unvaccinated ground is shown as follows:—

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* With only one death and this an unsuccessfully revaccinated reservist.

Room or Class.	Unvaccinated Scholars.			Vaccinated Scholars.			Total Scholars.		
	Taking Small-pox.		Escaping.	Taking Small-pox.		Escaping.	Taking Small-pox.		Escaping.
Room A (Standard IV)	8		0	0		8	19		19
(Remainder of Room A	12		2	5		17	23		25
Room B	13		30	0		13	31		61
Room C	4		8	0		4	14		22
	37		49	5		87	42		127
Total		77			92			169	

The interesting features of this accidental experiment are:—

(1) Every unvaccinated scholar in Standard IV developed smallpox, while every vaccinated one escaped.

(2) Of the 42 pupils in the remaining classes in Room A, twelve out of the fourteen unvaccinated went down with the disease.

(3) Of the five vaccinated who were attacked all were over 11 years of age, and none of them had been revaccinated.

(4) None of the revaccinated were affected.

(5) In Room B, 31 were vaccinated and 43 unvaccinated, all the former escaped while, 13 of the unvaccinated took the disease.

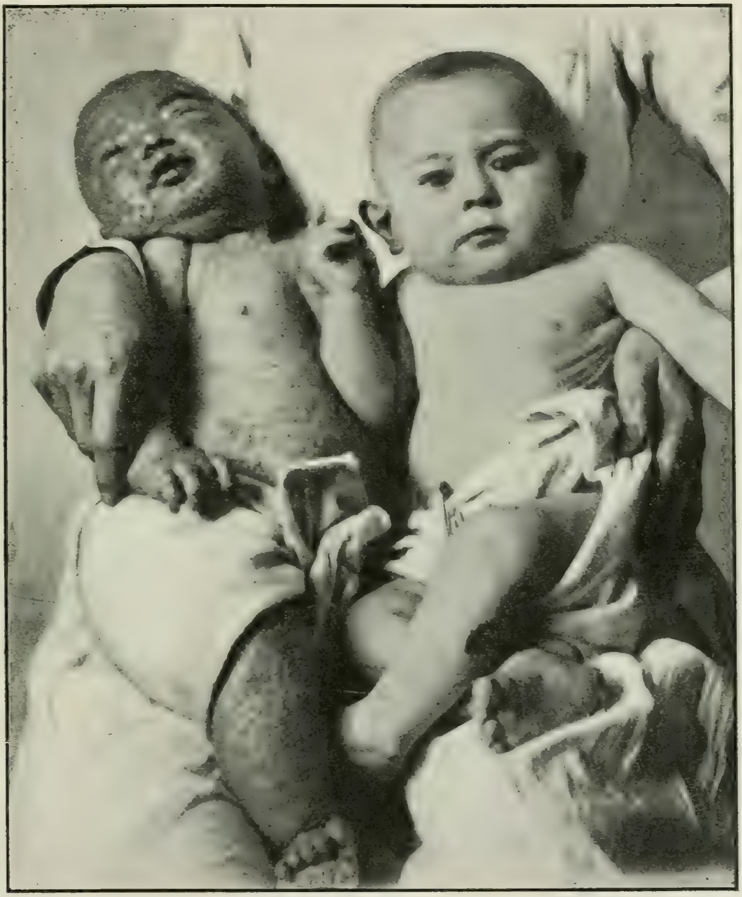
(6) Of the 26 scholars aged 6 to 9 years in Room C, 14 were vaccinated and 12 unvaccinated, while the former escaped, yet 4 of the unvaccinated took smallpox. Several similar instances have occurred in the writer's experience in rural schools in Ontario.

Protection of Doctors and Attendants of Smallpox Hospitals.

The effects of vaccination and revaccination in protecting medical men and nurses in charge of Smallpox Hospitals has so frequently been misrepresented that a few words upon the subject may be acceptable to the reader. If these vaccinated persons who live amongst and are brought intimately into contact with smallpox patients, escape the constant and repeated exposures to the infection, it may very justly be claimed that the cause of vaccination has been greatly strengthened.

London, Birmingham, Philadelphia.

The following are among many similar experiences. During 1876-79 there were admitted 11,412 smallpox cases to the London Hospitals, the total number of employees was 1,000, and of these only 6 developed smallpox, and these had not been revaccinated; while the remaining 994 had been so immunized. Again, in reference to the London Smallpox Hospitals, Dr. Maison stated in 1871 "that during the preceding 35 years no nurse or servant at the hospital had been attacked with smallpox." Similarly, Dr. Hill, Birmingham, Eng., reports during the epidemic of 1893 over 100 persons, employees in the City Smallpox Hospital, all of whom were revaccinated, not one contracted the disease, and at the Municipal Hospital Philadelphia, Drs. Welch and Schamberg, state during a period of 30 years in which time 9,000 cases of smallpox were treated, "we have not had a physician, nurse or attendant who had been successfully vaccinated or revaccinated prior to going on duty, contract the disease." And coming to still more recent years, in the same hospital 1901-1904, the same authorities state that of over 3,500 cases received not one had ever been recently successfully vaccinated. Again, in the same Hospital during a period of five years during which over 700 medical students visited the hospital to study the disease, only one student contracted smallpox, and he was the only one who had never been successfully vaccinated, the remaining 699 had been protected by vaccination.



SMALLPOX IN AN UNVACCINATED CHILD WHICH DIED—OTHER CHILD PROTECTED BY VACCINATION.

From "Welch and Schamberg on Acute Contagious Diseases."

The Effect of Sanitation Upon the Spread of Smallpox.

It is frequently stated by those who do not study the subject that the decrease in smallpox has been due to sanitation. If such an argument were true in respect to this particular disease, why should the rule not be equally applicable to scarlatina, measles and whooping cough ? Perhaps no two diseases are more contagious than measles and smallpox. But what are the actual conditions as learned from the reports of the Registrar-General of England ? We find that during the same period that in smallpox, the mortality has declined 72 per cent.; that of measles has fallen only 9 per cent., and during the same period, notwithstanding the great strides made in sanitary improvements of all kinds whereby the masses and the classes of England have benefitted the death rate from all causes has only fallen 9 per cent.

Again the reader is reminded that the death rate in smallpox has been limited to persons below 15 years of age, the age group in which scarlatina, measles and whooping cough are most prevalent; while the mortality of children, of this same age group, does not differ very materially from what it was one hundred years ago.

Perhaps one of the strongest replies to this argument of sanitation occurs in the report of the German Vaccination Commission, 1884. "The remarkable and persistent decline (of smallpox) in Prussia since 1875 can only be due to the vaccination laws of 1874, *because all other conditions remain the same in the two countries*, the only difference is that in Prussia the revaccination of all school children at the age of 12 years was made compulsory in 1874."

Inoculation.

To complete the history of the disease a slight divergence must be made to refer to the introduction into Europe of a practice which had prevailed for some time in portions of the Orient known as "inoculation," which consisted in the careful inoculation, either by means of an inoculation needle or lancet or the abrasion of the skin by means of blisters, and the subsequent impregnation of the raw surface with smallpox virus. The object sought for and obtained was the protection of these persons so inoculated with smallpox against an attack of the disease, which in those days was generally of a severe type.

Owing to the fact that the inoculated smallpox possessed the infectivity and, therefore, a certain degree of danger, this practice, although possessing some points to commend itself, yet because of the dangers attendant upon the procedure, has been altogether discarded as a recognized medical procedure. The lessons, however, derived from its temporary adoption have been to strengthen the recognized theory of immunity and to confirm the practice of vaccination by calf lymph.

First Use of Vaccine Obtained from Cowpox by Jenner.

In the year 1796, Edward Jenner, an English physician, first inoculated an eight-year-old boy with vaccinia obtained from a case of cowpox in another human subject, and as a result the boy developed a typical attack of cowpox, and upon being subsequently inoculated with variola the results were negative, thus proving that in one case humanized vaccine lymph possessed the same immunizing power against smallpox as did the natural virus. The two succeeding years were spent by Jenner in similar experiments, and so convinced was he of the scientific truth, that in 1798 he published a modest brochure on the subject.

The first to experiment with the discovery were Dr. George Pearson, physician to St. George Hospital, and Dr. William Woodville, physician to the Smallpox Hospital, London. The reports of these two experimentors were adverse to the use of vaccine, but a careful enquiry and investigation made by Jenner showed the effects reported by these two early experimentors were due to a careless handling of the virus.

From the extent of the ravages of the disease the medical profession and the public were prepared to experiment with and try anything which offered the least bit of protection against the disease, with the result that before long the merit of the discovery was almost universally admitted.

Introduction of Vaccination into Europe and America.

France sent Dr. Aubert to London in 1800, as the representative of the National Institute School of Medicine, and in 1805 Napoleon ordered all his soldiers, who had not had smallpox, to be vaccinated.

In Spain, in the first year of the 19th century, Don Francesco Pignelem performed the first vaccination, and the Government supplied lymph to the colonies by arm to arm vaccination of children on board ships.

In Italy, Dr. Louis Sacco, of Milan, was made director of vaccination in 1801, and in a few years had performed over 20,000 vaccinations.

Through the personal efforts of Dr. De Cairo, of Vienna, vaccination was employed in Austria in 1799, and such was the gratitude of the inhabitants of Brunn, they erected a building to the memory of Jenner, and annually held a festival upon his birthday.

The most marked early recognitien received by this treatment was from the Royal House of Prussia, to whom Jenner personally sent virus which was used first on Princess Louisa, the King was so pleased with the results he founded a Royal Inoculation Institute in Berlin, the practice spreading rapidly to the various kingdoms and duchies. Bavaria, in 1807, made vaccination compulsory, being the first to adopt the beneficent law.

From Vienna the practice was carried to Switzerland and Russia, by students of De Cairo. In the latter country the Emperor became personally interested, from the fact it would save his people much suffering and bereavement.

In 1801, Jenner sent vaccine to Dr. Marcet, of Copenhagen, and here, too, the ruling monarch became interested, and a commission was adopted to investigate and report, the result being the enacting of legislation which stamped out smallpox in Denmark for twenty years.

First Demonstration of Protection Afforded by Vaccination in America.

The first medical man to practice vaccination in America was Dr. Benjamin Waterhouse, of Boston, the first Professor of Medicine in Harvard, who experimented first on members of his own family, and, as might be expected from this modern hotbed of fads and fallacious doctrines, many malicious statements and facts were advanced, by reason of the many medical men who visited the doctor's house to study the cases, and possibly as a result of this, we find some two months subsequent to vaccination Dr. Waterhouse's children were sent to the hospital and freely exposed to the infection of smallpox, where, it is needless to say, they were absolutely immune. Waterhouse is said to have exclaimed, "One fact in such cases is worth a thousand arguments." It was not long after this that the doctor forwarded to President Jefferson, at Washington, some virus, and preferred the request that it be given into the hands of some careful medical practitioner. After some delay, the president, on August 6th, 1801, had Dr. Wardlaw, of Monticello, vaccinate some of the members of his own family, and in this manner was begun the good work in the United States.

In view of the sad havoc smallpox had been making in the world up to this time, and with such an auspicious beginning and such successful results, can it be wondered that the custom came rapidly into general use. With the scars and disfigurements of a disease from whose attack none were safe except such as bore upon them its impress, is it at all surprising the people who had met such a fatal enemy should hail with delight this new benefactor ?

Vaccine.

As the reader may not understand the nature or origin of the vaccine used at the present day, a few particulars regarding it may not be out of place in this article. The reputable producers of vaccine (in the United States, from which country we derive our chief source of supply) are under the inspection of the Federal authorities and are licensed by that authority. The laboratories and stables are kept as clean and aseptic as possible, the inoculating of the calves and subsequent collection of the lymph and vesicle pulp, is surrounded with all the aseptic precautions practiced in modern surgery. The young calves themselves are carefully examined before being inoculated, and after the collection of the lymph, as pulp on the fifth day, the carcasses are examined by a veterinary surgeon, and if any indications of disease are found, the product of that particular calf is destroyed.

Two kinds of vaccine are used at the present time, the dry points and the glycerinated lymph put up in capillary tubes, the latter being most in favor amongst the best observers. It is this latter form which has the approval of the British Royal Vaccination Commission, and the form used in vaccinating the subject as shown in the illustration of a successful vaccination appearing in this article.

As an indication of the change of opinion in the Province of Quebec regarding the importance of vaccination as a prophylactic of smallpox, the Provincial Government has two vaccine farms, one at Montreal, the other at Quebec, both of which receive Government assistance, and are subject to Government supervision. The one in the environs of Montreal I found to be well conducted and carefully operated.

General Rules Given for Vaccination.

The following dicta may be set down in reference to vaccine virus :—

The employment of vaccine virus free from contamination is necessary for the proper performance of vaccination.

The vaccine should be obtained from fully developed and typical vaccine pocks when in the vesicular stage, and only when the contents are clear and free from pus organisms.

The use of the contents of vesicles, becoming purluent, or of the dried scabs or crusts, is inadmissable, owing largely to the danger of mixed infection.

Only animal vaccine virus obtained from calves or young heifers, should be used.

And only the product of those manufacturers whose premises and process are subject to Government control, inspection and supervision, should be authorized for general use.

The rules regarding vaccination itself, may be stated as follows :—

Vaccination should be performed within the first year of life.

The only contra-indications for its performance at this time are permanent and severe illness throughout the first twelve months of life.

The most suitable period within the first year is that before dentition begins, viz., probably from the fourth to sixth month.

If smallpox appears in the neighborhood, vaccination should be imperative upon all unvaccinated infants without exception.

The Technique and Hygiene of Vaccination.

While the operation of vaccination is a simple one, yet precision and care must be exercised in regard to it.

The usual site of operation is the outside of the arm, just below the shoulder.

The person and underclothing of the one to be vaccinated should be clean; preferably the vaccinor should have a bath just before.

The site of the vaccination should be carefully cleaned with soap and hot water, alcohol applied by means of absorbent cotton, and the parts subsequently washed with sterile water.

The stronger disinfectants should be carefully avoided.

The children of poor persons should by preference be vaccinated at public stations.

The skin should be scarified by either a carefully sterilized vaccine lancet or needle, for an area of a third to half an inch—the drawing of blood is to be avoided, hence deep scarification is not necessary.

In case two or more scarifications are made, the same should he made so as to allow from three quarters to an inch of healthy skin between each.

The lymph should be allowed to dry upon the part, a process which takes from 10 to 30 minutes.

After drying the parts may be protected by a layer of carefully applied sterile cotton for at least 24 hours; and further, subsequent rubbing of the undershirt or sheet by means of a piece of clean linen sewn in place in that portion of the garment which would naturally come in contact with the part.

The patient should be cautioned against rubbing or scratching or otherwise interfering with the part.

The Normal Course of Primary Vaccination,

By the above expression is meant a description of the actual conditions following "a Vaccination." See illustrations from first to twelfth day.

In the majority of cases there is a lapse of three days during which nothing abnormal is noticed at the site of the vaccination, the temporary inflammatory reaction at the site disappearing in about 36 hours after the operation.

At the end of the third, or beginning of the fourth, day, flat elevated red papules appear along the lines of scarification; on the fifth day vesicles appear thereon, extending to the outer edge of the scarification, and on the sixth day when they are filled with clear lymph and are pearly white in appearance, completing development on the seventh day. Accompanying this change at the site of the scarification, the areola carried by the congestion becomes broader and in time is surrounded by a second congested area milder in character and paler in color. Upon the eighth day, the vesicles lose their pearly appearance, owing to the gradual formation of pus, and it is usual at this time for constitutional conditions to manifest themselves, as slight fever, headache; in children, restlessness, loss of appetite and peevishness; about the tenth day these symptoms disappear, and there is at the same time a subsidence of the local inflammatory conditions, the pock gradually dries up, a scab forming, which drops off in the course of the next two weeks, leaving a scar rosy in appearance and corresponding in size with the pustule; this scar ultimately becomes whiter than the surrounding skin.

Revaccination.

Experience teaches that the immunity afforded by a primary vaccination against smallpox, gradually diminishes with advancing years, and in many cases becomes extinguished altogether. A second vaccination has been resorted to as affording a continued immunity against smallpox. As the protection afforded by a primary vaccination differs in each individual, it is difficult to lay down any rule that will serve as a typical description of the course of the resulting scar: suffice it to say, that the more typical the results, the more indicative are they of the lessened immunity against smallpox conferred by the primary vaccination.

In regard to the age at which revaccination should be performed, the statement of the German law will best indicate the consensus of authorities upon the subject Every child must be vaccinated before the completion of the first year of life, except it has had smallpox, or physical disability prevents. Every pupil of a public or a private school must be vaccinated, (revaccinated) between the 13th and 14th years of life, unless it has had smallpox, or has been successfully revaccinated before reaching this age.

Complications and Dangers Attendant on Vaccinatton.

Regarding the dangers of vaccination it is found that most of the cases reported by the laity as due to vaccination will not stand the test of a careful and intelligent investigation. Deaths have, from time to time, occurred as the result of vaccination, but neither the deaths nor the complications are as many or as serious as the general reader is led to believe, as the following review of this portion of the question will show. Before doing so, however, the reader should be impressed with the fact that probably fifty million human lives have been preserved through the influence of vaccination during the last century. It must also be it remembered that the mere prick of a pin or needle, or inhalation of chloroform are often attended with fatal results—indeed many of the minor accidents incident to modern life are followed by or attended with suffering, and often result fatally, without ever the opponents of vaccination raising a word of complaint or protest.

*The figures in the hotbed of prejudice, in England, are as follows: During the years 1881 to 1889 the average number of certified deaths connected with vaccination was 53, or an average death-rate of one to every 14,159 primary vaccinations, while the deaths from chloroform inhalation were one in every 2,000 anæsthesias, and for ether one in every 20,000.

The German figures indicate that vaccination is more free from serious results than in England. †Voight states that, within the last five years, he had vaccinated 100,000 people with but one death, and he stated the ratio of deaths to have been one to every 65,000 vaccinations.

The discussion of this question with the laity is most difficult, as naturally, their grasp of medical theory and practise is, at the best, but hazy, and they cannot be expected to grasp the true inwardness of cause and effect. Those complicatians to which death is ascribed as the direct result of vaccination will be mentioned.

(*a*) Septicæmia and Pyæmia (blood poisons). This is a rare result of vaccinations. It was, however, much more frequent in the days when humanized vaccine was employed. Deaths reported as following the use of glycerinated bovine vaccine must be looked upon as due to secondary infection.

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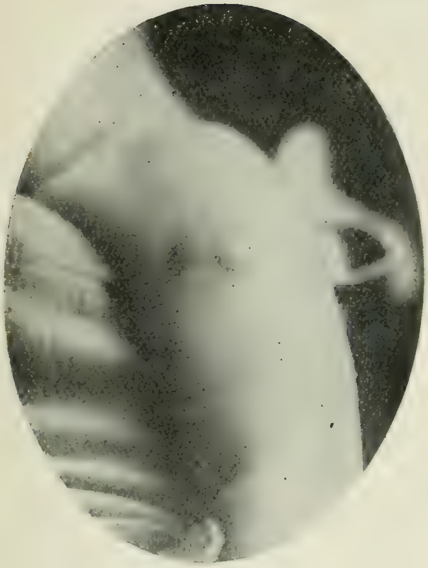
*Welch & Schamberg. (1905).

†History of Smallpox and Vaccination. (1901).

PLATE I.

A SUCCESSFUL VACCINATION.

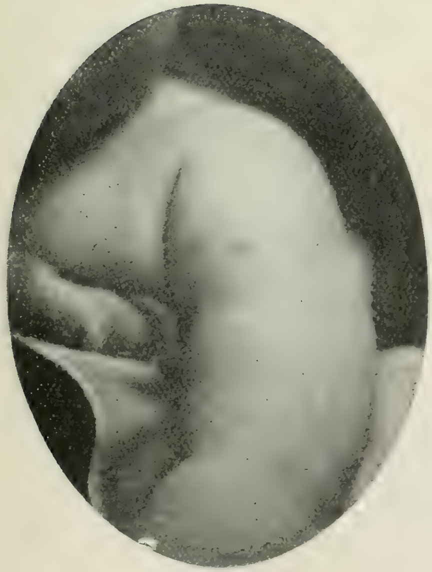


First Day.

Second Day.

PLATE II.

A SUCCESSFUL VACCINATION.



Third Day.

Fifth Day.

(*b*) Erysipelas, is an acute infectious disease due to a specific germ which generally gains entrance to the body through a wound, hence it is not to be wondered at that with bad personal hygiene and unsanitary environment, there would be an increased liability to this disease. This trouble, too, like the former, was common during the period of the employment of human vaccine; the reported deaths from this cause in Germany, as reported in 1877,† were only two in 1,252,534 vaccinations.*

(*c*) Tetanus, or lockjaw, is, so far as the writer is aware, unknown in continental countries, while the minority (or antis) of the British Royal Vaccination Commission in 1896, after careful, almost microscopic examination, could only find one instance where this disease could be by them considered as complicating vaccination. After a careful study of 52 cases, reported as coming under this heading, Dr. R. N. Nelson came to the conclusion that while the tetanus infection gained entrance at the site of vaccination, it was not introduced with the vaccine virus, but at some period subsequent thereto. If, as has been suggested, the tetanus germ could be derived from hay or manure, and thus find its way in the bovine virus, there would naturally be found a larger number of cases, due to the infection of the serum when taken from the calf, which is ultimately made into 5,000 vaccinations, for infection of a particular tube in the laboratory is impossible, and the *Director of the Hygienic Laboratory of the United States Public Health and Maine Hospital Service was unable to find the tetanus (lockjaw) germ in a large number of glycerinated points and tubes purchased in the open market; and he states further that the tetanus germ cannot grow in glycerinated vaccine or on dry points. Here, too, we find reference to the subject by the British Commission, so frequently quoted:—"A female child of two months developed tetanus on the 23rd day after vaccination. It was found that the child was vaccinated from the arm of a female infant aged five months, and at the same time and with the same lymph six other children were vaccinated, and none of them developed tetanus (lock-jaw) or sore arms." The general conclusion is, that in most cases the tetanus infection is taken into the system subsequent to vaccination.

Syphilis. With the use of glycerinated calf lymph and the discarding of humanized lymph, this question can be eliminated from the list, as the bovine species is totally unsusceptible to syphilitic infection.

Tuberculosis. The remarks just made in reference to syphilis may be taken to apply almost equally to tuberculosis, for it is a well established fact that calves rarely have tuberculosis; indeed, this extremely rare condition is perfectly safe-guarded by the subjection of the calves to what is known as the tuberculin test before being vaccinated, and the post-mortem adds an additional safe-guard, if such were necessary.

Leprosy. This, the last of the list, may be dismissed by stating the objections are covered in the remarks on tuberculosis.

The conclusions arrived at by Dr. Ernest Hart regarding the dangers from vaccination, after a careful investigation of the subject in conjunction with Dr. Barlow, for the Royal Commission on Vaccination, may be summed up as follows:—

"The danger from invaccinated disease is almost nil."

"In a fractional percentage of cases, grave complications arise, but in almost every instance they are due to inflammatory or sceptic affections, such as are common to wounds, and the conditions are found to depend on more extraneous circumstances, than on any inherent properties contained in the vaccine itself."

Children, after vaccination, are at all times liable to suffer from various harmless rashes, which may give rise to some distress. If, however, the child is

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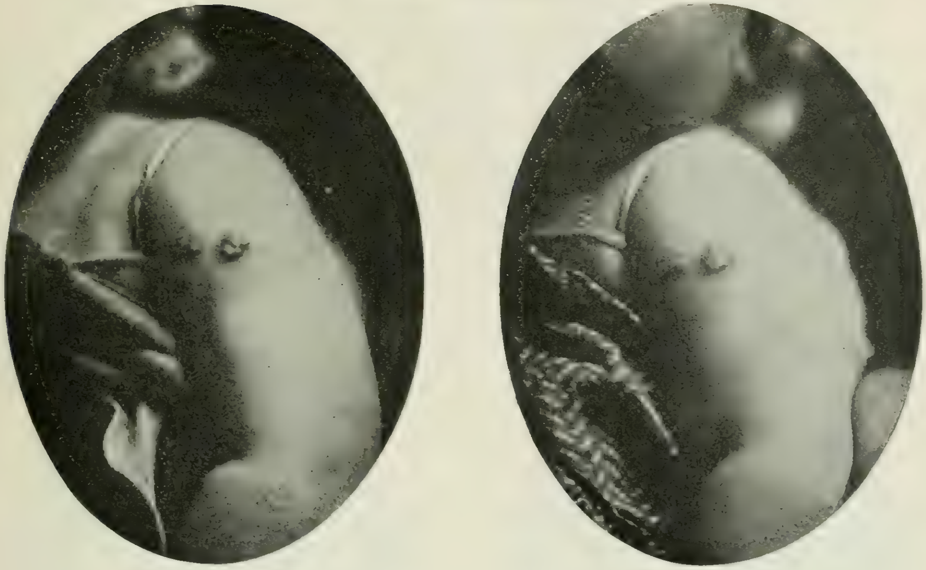
*Welch & Schamberg. (1905).

†History of Smallpox and Vaccination. (1901).

PLATE III.

A Successful Vaccination.

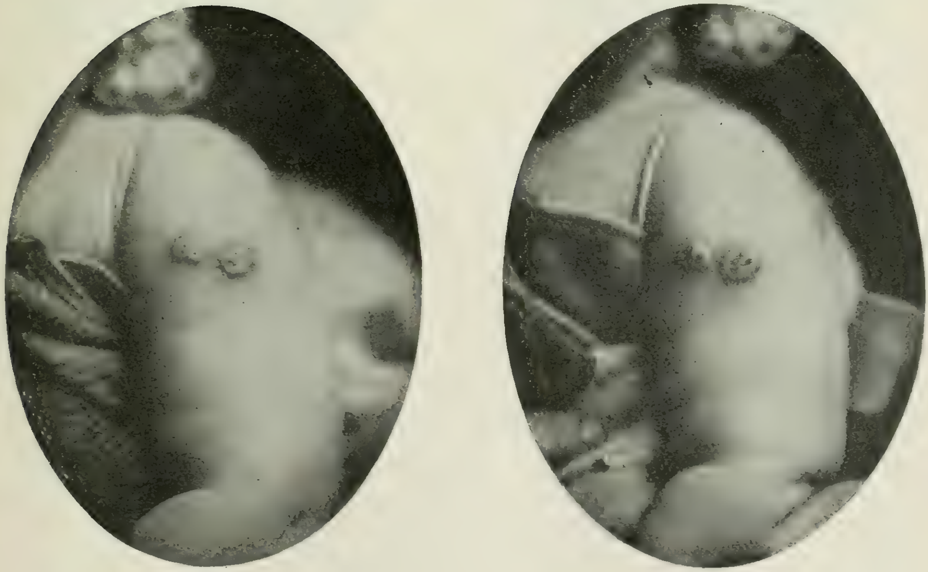


Sixth Day.

Seventh Day.

PLATE IV.

A Successful Vaccination.



Eighth Day.

Ninth Day.

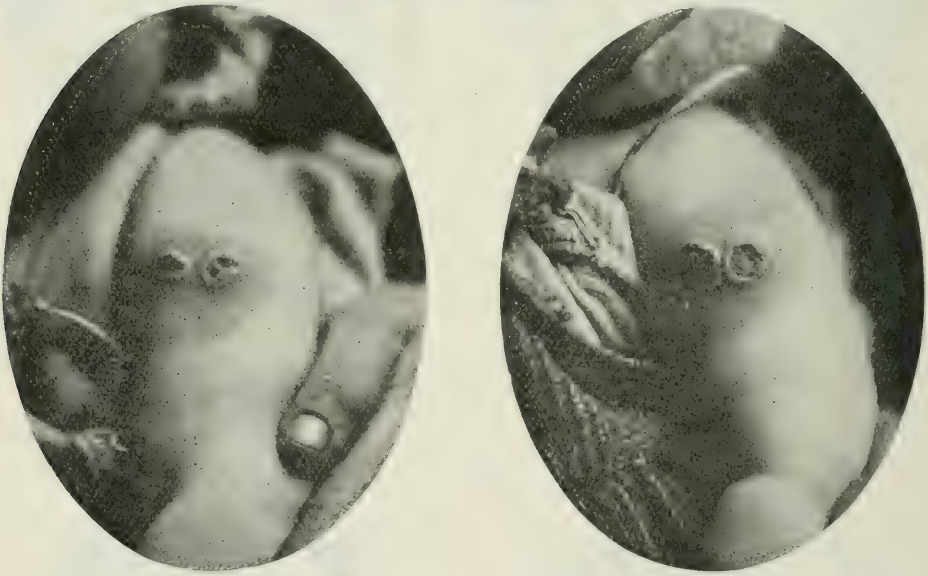
healthy, its circumstances wholesome, the lymph carefully selected and properly used, and if reasonable care be exercised after vaccination there is no doubt the dangers of the operation are extremely small.

Ontario Experience of Vaccination.

In concluding this important part of the subject, I would sum up my experience of 16 years' work in Ontario, during which, either personally or through the aid of assistants, over 40,000 vaccinations have been performed, and performed often in the most unsatisfactory conditions, I have never seen a fatality follow vaccination; I have never seen a life in jeopardy by reason of the inoculation of vaccine, and I have yet to see the first case where illness of either a temporary or permanent character could be ascribed to bovine vaccine. Further, in those cases where any injury has followed the operation, it has always, in my experience, been due to contributory negligence allowing of a secondary infection, the greater part of which could have been prevented, had those persons observed even the elementary principles of cleanliness, and in the majority of cases a simple abrasion of the skin minus the vaccination would have been followed by precisely similar conditions.

PLATE V.

A Successful Vaccination.



Tenth Day. Twelfth Day.

Ontario Vaccination Law.

Under the statutes of the province vaccination is compulsory.

"Every child born within the province shall, within three months after birth, be vaccinated either by a qualified medical practitioner or by the person appointed by the municipal council for that purpose."

Every child over the age of three months becoming a resident in the province is required to be vaccinated.

The certificate of vaccination cannot legally be given until the eighth day after vaccination has been performed.

If, in the opinion of a medical practitioner, a child is found unfit for vaccination, a certificate to that effect remains in force only two months. In any case the child must be presented every two months to permit of renewal of certificate, otherwise the child must be vaccinated.

Revaccination within seven years may be required when deemed necessary, from students in attendance at high schools, collegiate institutes, colleges and universities.

Revaccination within seven years may, under certain conditions, be made compulsory in any particular municipality or throughout the province generally.

Authority is given to the councils of all municipalities to enforce the foregoing provisions of the Act, and upon them necessarily rests the responsibility. If, therefore, lives are lost by reason of smallpox, or personal and municipal losses of a financial character happen, through failure to follow out the wise provisions of the Act, the blame and loss rests with those failing to comply therewith.

If municipal authorities fail to comply with the provisions just referred to, the people of this province will have cause to regret their stupid indifference, for assuredly smallpox will visit us again in all its old time severity, and finding us in a similar position to that in which the inhabitants of Montreal were about 1885; we will have to pay the penalty in like manner to that city, both in family bereavement and in financial loss, in which case the residents of this province will curse their own stupidity in listening to the seductive words of false teachers—and many parents will pronounce their anathemas when all too late to save the lives of their loved ones, against the present agitators who launch from time to time their squibs and skyrockets amidst an oratorical display as fanciful and lasting as the grandest display of fireworks one could wish to see.

The Anti-Vaccination Movement.

The discovery of vaccination, like other epoch-making events of a scientific characer, has met with opposition, abuse and ridicule, chiefly from English-speaking people, and described by writers of authority as metaphysicians, religious fanatics and faddists, persons who from time to time imbibe distorted, pernicious and intoxicating ideas of a few misguided scientists, who, seized with their own infallibility, often glibly discuss and dogmatize upon questions about which they possess little, if any, practical knowledge, scientists who often advance false statements and distort truths, facts and figures, all of which are eagerly swallowed by the faithful, notwithstanding the fact that their statements have been discarded by the highest sanitary authorities of the most cultured nations of the world as unworthy of consideration. The majority of the faithful, if they possess any scientific knowledge at all, would be of better service to the state if they applied it along their own particular calling in life, where possibly they may be considered authorities, and expected to dogmatize or pose as critics, but who, certainly, are a pernicious element in the community and ill-fitted to be the guide of public opinion in matters that appertain to preventative medicine. As the result of the action of these misguided opponents of the doctrine of the efficiency of vaccination in successfully preventing the spread of smallpox, many of the present generation, like their ancestors of biblical history, have been pleased with the prophesying unto them of smooth things, and knowing themselves still less than their false prophets, have unwittingly accepted their teachings. To such we commend the facts presented in this pamphlet.

The same or similar arguments were used against vaccination as were advanced against Franklin's discovery regarding electricity, by over-pious religious fanatics, who regarded both lightning and smallpox as God's punishment for sin. It is to be noted, however, that but few clergymen have brought forward the religious objection, the objectors have been those in the narrowest circles of the excessively pious laymen.

Perhaps the most persistent objections have been those of a politico-legal character, raised in connection with compulsory vaccination, the line of argument being directed particularly at the principal of "compulsion," as being contrary to the free-will and liberty of the individual, the argument being that vaccination and re-vaccination are matters that concern the individual and not the state, and in this manner a number of susceptible individuals are influenced and led to believe that they are the only guardians of liberty. It must be pointed out that the arguments on these lines are based on false conceptions of liberty, for personal liberty and free-will have legal limits, and under no condition can they be permitted to come into collision with what is for the common weal.

The result to the communities where anti-vaccination has prevailed, has invariably been the loss of life, loss of time, loss of money, and the increase of suffering; in short, a reverting to those conditions which prevailed, not only on this continent, but throughout the civilized world, previous to the adoption of vaccination.

As the bulk of the statements, facts and figures contained in this article are given to educate the reader in all that appertains to the question, and the instances given are but examples of hundreds, nay thousands, of similar if not stronger convincing facts, all of which go to prove the unbounded benefits to be derived from the practice of Jenner's gift to his fellow-men, no further reference will be made to the opponents of the practice. I will, however, submit the opinions of four leading authorities upon the question, one of whom practises in Basle, Switzerland, the other two have been workers in the special sphere of medicine for many years in the United States, and the fourth is the eminent and worthy successor of the immortal Pasteur.

Dr. Immerman's Resume.

Dr. Immerman, of Basle, in a monograph on vaccination in Nothnagel's "Encyclopedia of Medicine," in a series of masterly arguments, completely vindicates vaccination as a preventative of smallpox. In his "Closing Remarks" occur the following as his *resume* of the question.

Up to Jenner's time, variola was the most common and deadly of epidemic diseases.

Vaccination was the first means that produced a change in a prophylactic respect, and it fulfils the claims of a perfect prophylactic against smallpox.

It is easily performed and its practice is dangerous to no one.

It lends to the vaccinated, when it takes, an almost sure temporary protection against smallpox.

Actual injuries to health in general are not to be apprehended.

The doctrine of degenerating influence in the race is simply false.

The diminution in the morbidity and mortality of smallpox in the nineteenth century is the result of vaccination and nothing else.

The natural contagiousness and malignancy of smallpox have not grown less, for the non-vaccinated are attacked when the opportunity occurs, as in former times.

If the non-vaccinated suffer less from the disease at the present day it is because the opportunities are less common, epidemics being less frequent and extensive as a result of vaccination.

The beneficial influences of one vaccination (done in infancy), is evident in that the relative morbidity and relative mortality for the vaccinated in a mixed population during an epidemic of smallpox, is less than for the non-vaccinated.

Revaccination and its periodic repetition renew the complete temporary immunity.

Scruples on the part of the state against compulsory vaccination are weak, since vaccination is useful to the individual and indirectly protects the community.

Compulsory vaccination of children is not only a desideratum, but an ethical duty, since children, as yet without the power of deciding for themselves, should not be given over arbitrarily to their elders, and thereby eventually become the prey of smallpox.

The opposition to compulsory vaccination demonstrates that the opponents do not possess a mature understanding of one of the most important questions in hygiene.

In the conscious security of the body against the threatening assault of infection, lies not only one of the principal problems of hygiene, but an actual problem of human culture.

Summary by Drs. Welch and Schamberg.

Referring to the value of vaccination, Welch & Schamberg, of Philadelphia, in writing upon the subject of smallpox, state, "We know of no eminent physician who is not convinced of the efficacy of vaccination. Those physicians who have had a large practical experience with smallpox are the most ardent, advocates of vaccination, for they have had the best opportunity of noting the behaviour of vaccinated individuals in the presence of smallpox. The few physicians who are found in the ranks of the anti-vaccinationists are usually men without practical experience in smallpox; they argue with statistics (often wittingly or unwittingly distorted) and not with facts derived from personal observation. These persons have in various countries banded themselves together to antagonize the practice of vaccination and to oppose compulsory enforcement."

"We prefer to look upon these persons as *misguided*, rather than regard them in a less charitable light," and these authorities conclude as follows: "Anti-vaccination propaganda have caused many innocent victims to be consigned by smallpox to a premature grave," and in this, as in their preceding statements, the writer, after sixteen years of practical experience with the disease, fully and heartily concurs.

Latest Words of Prof. Metchnikoff.

Prof. Elie Metchnikoff, Director of the Pasteur Institute, Paris, and successor to its great founder—in his recent work on "Immunity in Infective Diseases," (1905)—speaking of Protective vaccination, thus expresses himself, and referring to Germany :—

"Compulsory vaccination was introduced there more than a quarter of a century ago (1874), and statistical information has been collected with great care. With the exception of a slight increase during the period from 1879 to 1885, smallpox has diminished progressively since the proclamation of the new law, and has become so rare that in 1897 there were only five fatal cases in the whole German Empire. In the space of 13 years (1886-1898), in a population which embraces two fifths of the total inhabitants of the German Empire, there were altogether five fatal cases of smallpox occurring in persons who had been successfully revaccinated. Moreover, the majority of the cases of smallpox occurred in the maritime towns or in the vicinity of the frontier of the Russian Empire. Specially favorable results have been obtained in the German army, in which, even before the law of 1874, vaccination was compulsory. In twenty-five years there occurred in the Prussian army only two cases of deaths from smallpox. In summing up the statistical data on vaccination Kübler, from whom we have borrowed the above statements, expresses himself as follows: "The history of smallpox must in all cases register the fact that this dreaded disease has, as the result of general vaccination, not only become rare in the German Empire, but it has almost completely disappeared." The example of Germany encouraged several other countries to introduce compulsory vaccination, and Roumania, Hungary and Italy, have in turn promulgated similar laws. Here also, it was not long before satisfactory results were obtained. In Italy especially, the mortality from smallpox has largely decreased in recent years. . . . . . *In France a law is being framed, which will render infant vaccination compulsory. Up to the present, this has not been the case, and smallpox from time to time causes considerable ravages, as we may see at this moment in Paris. During recent years the mortality from smallpox in France has been from 90 to 100 times greater than in Germany. It is greater amongst the female population than amongst the males; this constitutes a fresh argument in favor of vaccination. Although not compulsory for the whole of the French population, it is so for soldiers and for children who carry on their studies in schools, and it is for this reason that smallpox is rarer amongst males. The most complete demonstration of this is found in the incidence of smallpox in the French army.

In spite of a less numerous contingent of troops, (451,941-457,677), the mortality from smallpox was greater during the period when vaccination was not yet carried out generally (1885-1887), than during the period of 1889-1896), when it was vigorously enforced on a much larger number of soldiers, (524,733-564,643). From 13.6 fatal cases per year in the first period the annual figure fell to 6.

It follows, when we take into consideration the whole of the very numerous data at our disposal, that the usefulness of vaccination, followed by revaccination after some (5-7) years, cannot be seriously called in question.

Personal Experiences.

The experience of the Medical Health Officer of the City of Ottawa, as regards the outbreak of smallpox, which occurred in that city in 1902, is, as given by Dr. Robert Law, "343 cases occurred in 269 houses; of these 343 only 29 showed a vaccination scar, all of many years' standing. Four (of these) claimed to have been revaccinated two years before, but showed a very faint scar." As to the effects of vaccination, this officer states, "the carrying out of a general order for vaccination soon showed its effects in the decline of the epidemic, not one person who complied with the law developing smallpox." Of the many thousands of vaccinations performed at that time, Dr. Law states there were no serious results reported.

As previously stated, during sixteen years many opportunities have presented themselves to study the question in all portions of the province in outbreaks attended with deaths rivaling any of the serious epidemics of history, as well as in others in which the mortality has been as low as any on record. The immunity to the writer has come from a primary infantile vaccination, a revac-

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* This law has recently been passed, making both vaccination and revaccination compulsory.

cination before the twelfth year of life, both with humanized lymph, and from subsequent revaccination—and to this fact alone is due the immunity he possesses.

During this period nearly 5,000 cases have been examined, and several hundred treated personally by the writer, and in not a single instance has the disease been seen in a person presenting a typical vaccination scar, the result of a primary vaccination within seven years of the attack of smallpox; and no instance has presented itself where the patient has ever been revaccinated—while on the other hand, in hundreds of families, immunizing effects of vaccination have been exemplified, in perfectly protecting those vaccinated, against smallpox.

During these sixteen years I have only met with one example of a person being apparently a natural immune. Again, I have repeatedly seen the vaccinated father and mother nurse a family of unvaccinated children through weeks of smallpox, without themselves contracting the disease, even in a modified form, although that one vaccination had been made in the case of many parents more than forty years before.

In the schools of the province several instances have occurred where the pupils of a form have been exposed for days to the infection of smallpox, and the disease has attacked only the unvaccinated scholars.

During the epidemic which prevailed some five years ago in New Ontario, chiefly among the shantymen, a staff of fifteen officials were exposed daily for more than two months to smallpox, but in no single instance did any of these officials, all of whom were revaccinated before engaging in the work, contract smallpox.

In one camp, which had to be quarantined owing to a case of smallpox having occurred therein, all the employees (46 in number) but one, were immediately vaccinated, the one who refused, stating he was prepared to swear he had been vaccinated, and also had suffered from smallpox, although no evidence of either could be found. Under these conditions he was allowed to pass unvaccinated. The forty-five proved immune to the disease, while the one ignorant and conscientious (?), but unscrupulous objector developed smallpox, and within the three weeks of my visit died a horrible death, an object lesson to all of the same ilk.

Notes on the Illustrations.

Smallpox.

The three illustrations are from photographs very kindly furnished by Dr. Jay F. Schamberg, Philadelphia, U.S.A., the joint author with Prof. Welch of the Work, "Acute Contagious Diseases," from which the illustrations are taken.

The pictures are so striking, and show the effects of a primary vaccination in preventing smallpox in two instances and in modifying in the third that no comment thereon is necessary.

Vaccination.

The ten illustrations are from photographs taken by Park Bros., Toronto. The patient, an infant, was vaccinated on April 7th, 1906, by Dr. Rowena G. D. Hume, with glycerinated vaccine manufactured by Mulford. The first photo was taken immediately after vaccination, the others in each of the succeeding days with the exception of the 4th and 11th days which were Sundays. In every respect the progress of vaccination is normal and the illustrations may be taken as accurately showing what happens in the case of a normal vaccination.

Medical Inspector's Reports.

R. W. BELL, M.D.

Presented at the Quarterly Meeting held April 25th, 1906.

Report on Typhoid Fever at Fort William.

While at Sudbury in connection with a visit to the lumbermen of Northern Ontario, I received a telegram from your Secretary to hasten on to Fort William, and confer with the local authorities regarding a violent outbreak of typhoid fever which seemed to have got beyond their control. Reaching there a few hours later on the morning of March 2nd, I found Prof. Starkey, of McGill University, Montreal, had also just arrived on the scene, having been engaged to investigate the trouble by the municipal authorities.

That morning we met a large number of the Municipal Councillors, Board of Health, Water Commissioners, etc. From the Medical Health Officer I learned, that during the past year, typhoid had been more or less prevalent all the time, that he had repeatedly called the attention of the local Board of Health to the conditions prevailing, without result, or receiving any encouragement towards improvement. No complete statistics were obtainable as the cases were not as a rule reported, compulsory reporting not being insisted on until the 1st February last.

However, about the 1st January an alarming increase in the number of cases developed. In the Town Clerk's office I learned that for the year ending November 1st, 1905, there had been reported 60 cases with nine deaths. I could not get any figures between Nov. 1st, 1905, and Feb. 1st, 1906, but was told there had been six deaths from August 31st to Dec. 31st, 1905. During February 412 cases were reported, but probably several of these rightly belonged to the latter part of January, whilst there were 32 deaths. This terrible increase had caused consternation amongst the citizens, as the civic hospital was full, the large bunk house of the C. P. R. was full, the hospital at Port Arthur was full with cases from Fort William, whilst dozens of private houses were doing the best they could with their own sick, for want of hospital accommodation. Several of the resident physicians had been down with the disease.

All parties seemed agreed that the civic water supply from the Kamanistiquia River was the source of the trouble. A proclamation had been issued advising the citizens to boil the water for drinking purposes, and a deep well near the town hall (the only one in the town), which had been closed for two years, had recently been opened, and from it water for drinking purposes was being distributed to all who asked for it, although the Medical Health Officer told me he doubted its purity and had advised that it should not be used until a favorable report of its analysis should be received. For all domestic purposes, except drinking, the "Kam" water was in use, and probably also for drinking by many, as some persons openly boasted they had drunk it for years and were not afraid of it. Practically all citizens have been using the town supply of water, and as the disease is very evenly distributed over all sections of the town, and amongst all classes, there is no reasonable doubt as to the source being the water supply.

Dr. Birdsall had very full information as to the milk supply etc., of a large number of families where the disease had shown itself, and from this

I found about 30 families obtaining their milk from ten different sources, some having their own private cow. I, therefore, could only conclude that the milk had little if anything to do with the epidemic.

As pit closets are in common use, and into these there is little doubt much excreta is thrown without being disinfected, and as there are defective sewers, the sewage from which has been flooding cellars, it is to be expected that, the soil being saturated, the water supply may also be contaminated from this source. While the water supply was the original source of the disease and still probably accountable for many cases, without doubt personal contact and infection has been a predominant element in the enormous increase during the past month. The Mayor was very pronounced in his opinion that while the water supply was probably contaminated from the Ford Street sewer, still an accumulation of filth in numerous dead ends in the water mains, without valves for its discharge, was accountable for much of the present trouble, and stated that in January the mains were thoroughly flushed. On inquiry I found the flushing was only by increased pressure for a couple of days with the already contaminated water, so as to stir up any deposit in the dead ends. The citizens were not warned to avoid the water during this process, and so got an increased quantity of pollution for that period.

During the day, we were driven about the town and out on the bay, to see where the present ice supply is being obtained, and although from a much safer place than that of last winter, still I fear it is not from such a place as we can conclude is absolutely free from sewage contamination. Next we drove up the river, having the various sewer outlets and intake pipes pointed out, as far as the Canadian Northern coal docks, thence back through Westfort, seeing the location of typhoid cases, where drainage was to the river, or to sewers emptying in above the intake pipe.

At the Ford Street sewer, from Westfort, into which half a dozen water closets empty, some from houses with typhoid, and discharging into the river 300 or 400 yards above the intake, we were informed a septic tank had been built in January, but as it did not work properly and was not close, but leaking, it was nothing but a cesspool, and even if it did not leak, I protested against the liquid effluent being discharged into the river above the intake.

You may recollect that just one year ago, I was all over this ground because of typhoid the previous Fall, and reported on the whole situation, and amongst other things condemned this sewer. Asking if any action had been taken on my report of March, 1905, I was answered, "None, your report never was seen here until about a month ago, when a copy of the printed report of the Provincial Board of Health was received with it in." This was asserted by the Mayor, Town Clerk and about a dozen other town authorities who were present. I was first blamed, then your Board, in vigorous terms for not furnishing a copy of the report last year, as "had it been known to them, they would certainly have taken some action on it, and probably prevented the present outbreak." I was told in plain terms that we were to blame for the present epidemic.

I assured them a copy must have been sent to the local Board of Health (and have since learned from your Secretary that one was sent), also that I knew one was sent to the local Superintendent of the C. P. R., and in June a copy to the "Times-Journal" for publication, but I was again met with the assertion, "none was received by the Board of Health and it certainly never was published, as had it been, they would have taken warning and acted on it." However, I was in a position to state that on June 1st, I was in Fort William, and with a copy in my possession, had discussed it with the Medical Health Officer, with the Secretary of the Board of Health, with the Superintendent C. P. R. *re* ice supply, and with the Editor of the "Times-Journal," who commented freely on it next day, and to whom I shortly afterwards furnished a copy. Later I visited the newspaper office, and on searching the files for last June, I found my report had been published on the 24th, in full with a double-column heading. A copy of that date I secured and shewed to the Mayor, Town Clerk and several others, apparently much to the disgust of some of them, and so placing the blame where it properly belonged. I had, however, a few hours previous to this exposure, after considering the deplorable situation, advised that the first thing to be done was to secure an ample temporary supply of pure water for all domestic purposes, and as there was a doubt about the quantity and quality of the well supply, it might be prudent to arrange with the railway companies to bring over a supply on tank cars from Port Arthur, three miles away, as the C. P. R. was already doing for their own employees; next cut off the Ford Street sewer at once, and any other source of contamination above the intake, and have the residents affected used dry earth closets, and so reduce to a minimum, the possibility of pollution of the town supply, which will be persistently used by some people; then have the Board of Health confer with the physicians in attendance on the sick, in regard to united action to prevent the further spread by infection, improper disposal of excreta, etc.

The consideration next of securing a permanent supply of water was, I felt, an engineering problem. Objection was at once made to asking for water from Port Arthur, and the opinion was expressed that the septic tank would protect the Ford Street sewer. I was also told that Dr. Bryce's consent was obtained for that sewer, as a justification for its continuance, but they were careful not to state that it was only for surface and cellar drainage, while since then there had been permitted several closet connections by the town authorities. This same ungenerous reflection on Dr. Bryce I heard repeated several times, even to your Secretary two weeks later in this office, without mention of their own after closet connection until corrected by me. Nothing had been done to cut off the flow of this polluted sewer, as admitted to your Secretary up to the 16th inst. I might here state that the C. P. R. water main, taking its water from a few yards below the lower sewer, has two connections with the civic mains, to increase the pressure for fire purposes, if necessary. I could not find out whether these connections had been open or not of late, or whether any leak at the valves. The town officials did not seem to know who controlled these connections. I learned also that the intake pipes (2) at the power house, had been broken off within 12 feet of the shore last August, by a vessel dragging her anchors, and had not been repaired until the end of January, because of a dispute as to responsibility for cost. Meantime, the open ends, without strainers, were sucking in all the filth along the shore. Sanitary Inspector Rankin shewed me a report he made on 31st January regarding a visit to the power house, wherein he stated these pipes had been open for all these months and just repaired, but that he there found other conditions which were "most damnable." These he told me were two water closets in the power house (where there had recently been four cases of typhoid) discharging into the river, one having been almost over the end of the broken intake pipe, and the other only a few yards away. The intake pipes are now hung to a pier about 40 feet from shore and in about ten feet of water. As an utter indifference was apparently shewn to my suggestions about pure water supply and cutting off polluting sewers, etc., I decided to move on, but before doing so, I was informed quietly by two or three citizens, that I need not expect any consideration from the authorities of Fort William, as I had made myself a "persona non grata" to them, by first "suggesting that they should ask Port Arthur for a supply of water, which was an insult to them"; and secondly, by producing evidence that they knew last midsummer of my report, and of the probable result, if no action taken, thereby placing the blame on the proper shoulders, and declining to allow myself or your Board to be held up to the citizens as the scape goat for their negligence. The Mayor stated, on being confronted with the published report in the paper of the 24th of June, "I guess all the citizens will have to bear the responsibility." I told him I doubted if they would be willing to exonerate their elected representatives from the responsibility, but I said, "now tell me why the Ford Street sewer was not cut off," and he replied, "Well, I suppose the truth is, we thought it was only a box drain and did not amount to much."

Since leaving Fort William, I learn the municipal authorities find much fault with me for daring to speak of the condition of affairs there, outside of their town, some of my remarks finding their way, quite unintentionally on my part, into two newspapers, one of them from an overheard conversation with one of the Fort William Water Commissioners and published in a somewhat exaggerated form, the other from a conversation with some friends in Winnipeg. However, I do not understand it to be the duty of your Inspector to assist any delinquent municipality to hush up its sanitary neglect, but rather to warn the rest of the Province and protect the public generally.

It is to be feared that the desire to "get rich quick" influenced many citizens in the "marking time" policy adopted last year, when the unsanitary condition of the town was well known, either through unwillingness to devote time to improvement, or dread that too marked devotion to health matters might have a deleterious effect on the speculative deals in real estate agitating the town, by drawing attention to the unhappy state of affairs. At least I have been assured by residents of the town, that, to these reasons may be attributed the true cause of neglect.

I understand that with considerable assistance from Montreal, on the strength of Prof. Starkey's report, vigorous action has been taken to stamp out the present epidemic, which doubtless will soon be accomplished, but it is to be hoped there will not be a relapse into security and inertia as soon as this is ended, but that prompt steps will be taken for a complete renovation of the sewer system, and for a permanent supply of pure water. Until these are obtained, there will be constant risk of a recurrence of the present epidemic with its terrible death roll, the responsibility for which I think must rest heavily on some shoulders.

March 20th, 1906.

Report on Lumber Camps, etc., in Northern Ontario.

During a month's trip in February and March, I endeavoured to get in touch with the majority of lumbermen whom I had not reached in November and December last. Nearly all these were west of Sudbury, either on the "Soo," or main line of the C. P. R., and the C. N. Ry.

In another report I have mentioned specially those I found it necessary to prosecute for non-compliance with the Regulations. With the remainder I found the Regulations being fairly well complied with. The camps as a rule are in a good sanitary condition, the employers in their own interests finding it expedient to keep them so, and as a result there has been very little sickness during the past winter.

I saw many of the employers and also employees, and on the whole found them satisfied with the Regulations. I heard a few complaints from the men about the condition of camps, and unjust treatment by their employers. Most of them I investigated, and while some were justified, others were wholly unwarranted, or were grossly exaggerated.

In the "Soo" Hospital I found cases of men either ill or injured, from two camps, and who had, contrary to the Regulations, been discharged and thrown on their own resources. I visited their former employers in the Soo and at Blind River, and gave them to understand they must provide for these men until recovered, which they agreed to do.

There is, no doubt, a certain amount of feigned illness on the part of some men, which, however, should be detected by the contracting physician, but on the other hand, there is too often, I fear, an inclination on the part of some employers to get rid of any sick man as quickly as possible, without retaining any responsiblity for him. However, in cases of injury, I believe the employers, as a rule, see that the injured man is well looked after and provided for.

By far the most satisfactory plan is to have a resident camp physician, or one who devotes his whole time to camp duties. Where a doctor is engaged in private practice, and has to drive many miles, to possibly a small camp, certainly as satisfactory attendance is not likely to be obtainable, especially when, as I am informed occasionally is done, a portion of his rightful fee is deducted and applied to other purposes. One physician complaining of this, said to me, "If the employers are only going to pay us half fees, they can only expect half attendance," and of this the men justly complain, after the full fee has been deducted from their wages, and herein is one of the greatest causes of dissatisfaction.

It is openly asserted that the medical fees are frequently divided with the camp officials, and even with the heads of the firms, sometimes by the physicians voluntarily offering a rebate to secure the contract, and in some instances on the demand of the employer. I am pleased to say, however, that I believe very few physicians resort to such tactics, or submit to such coercion to secure contracts.

Along the C. P. R. and C. N. Ry. west of Port Arthur, there are many contractors with camps of 20 to 40 men taking out ties. A number of these employ the same physician, who devotes his whole time to them, but on the latter line there are several, who are compelled in their contracts with the company, to employ Doctors Mackenzie & Mackenzie, of Winnipeg, who, I am told, are the contracting physicians for construction work along the line. One of these physicians is registered in Ontario, but the other is not. They employ resident physicians along the line to look after the work for them, and I found one doctor who was supposed to visit and attend camps over 200 miles from his abode, which certainly cannot be done satisfactorily with only a tri-weekly train service, and as there are several physicians residing very much nearer, I suggest under Clause 12 of the Regulations, that these contractors be required to contract with some physician within a reasonable distance.

I investigated some complaints regarding a camp and lumberman on Rainy Lake. The employer, and physician, I interviewed at Fort Francis, and the complainant in Winnipeg. The main ground of complaint was concerning something over which our Regulations have no control; the other points were admittedly of very little consequence and easily rectified.

I visited and inspected the camp of the Kaministiquia Power Company at the celebrated Kakabeka Falls, a few miles west of Port Arthur, being kindly driven out by Dr. Laurie, M.H.O. of that town. Your Secretary had telegraphed me to visit this camp, as there had been reported pollution of the river by the Italian laborers. There had been employed 500 or 600 men on the works last Fall, and at the time of my visit (March 5th), 200 to 300 still employed, while a few were hanging about waiting for spring, when the larger number would again be required.

I found the sanitary condition of the camp excellent, no drainage into the river, all buildings being several hundred yards back from the stream. Dr. Dean, physician for the works, is untiring in his efforts to preserve a clean and healthy camp, and he receives every assistance possible from Messrs. Leonard and Rogers, the engineers in charge, whose eagle eyes not only watch closely their own employees, but also the camp followers on adjacent territory, and who mete out summary ejectment from the premises, to those who are undesirable characters, by dynamiting their shacks, which is without doubt the only effective disinfectant for some of these "unsanitary grease spots."

I might add that a number of mining camps on the line of the C. P. R. near the western boundary of the Province, were brought under my purview during this trip, and here the owners or managers are falling into line, and providing for the better and more sanitary condition of their works, and contracting with physicians to look after their employees.

Railway construction camps on the line of the G. T. P. Ry. from Fort William north, are being rapidly put into operation, but under the careful supervision of Dr. Ewing, the contractor's physician, who has had several years' experience in this work, I am sure every precaution will be taken to preserve a sanitary condition, and attend to the health of the men. These works may be visited later, but in the meantime, Dr. Ewing assured me, no pollution of the Kamanistiquia River or its tributary streams adjoining these construction works was permitted.

March 31st, 1906.

Report on Prosecution of Lumber Firms.

As instructed by your Secretary, about the middle of February, I proceeded to New Ontario to prosecute several employing lumbermen who were not providing medical supervision for their men as required by the Regulations, either through neglect or deliberately setting the Public Health Act at defiance.

I began at the "Soo," and on the 16th Feb., before Stipendiary Magistrate Quibell, laid information against J. J. McFadden of McFadden & Milloy, —. Kennedy, Manager for Burton Bros., John Munn, Manager Echo Bay Lumber Co.

The first named firm I had tried for over a year to reach, during three previous visits to the Soo, and by several letters, but never could find them in person, and no attention was paid to correspondence.

Burton Bros. camps were reported in a filthy condition, and in them smallpox had broken out a few days before. All three with Mr. Burton appeared before the Magistrate at 11 a.m. on 19th Feb. Mr. Munn at once pleaded his neglect, and was willing to immediately obey the Regulations. Messrs. McFadden and Burton while admitting non-compliance, made many excuses and asserted that scarcely a lumber firm on the "North Shore" had a medical contract; that they could not get men if the Regulations were carried out, and in fact everything was wrong in their opinion. Their views are certainly not in accordance with those given me by many others. I asked for the names of other delinquents so I could prosecute them, but they would not or could not give them. I also asked for specific cases of the unsuitableness of the Regulations, but was met with the reply that, "the Regulations are all right if enforced." The Magistrate adjourned the court until 3 p.m. and advised them to make medical contracts and produce them at that hour, when he would consider the leniency to be extended to them, as he understood our desire was not for a heavy penalty, but to compel them to live up to the requirements of the Act. On reassembling at 3 p.m., Messrs. Munn and Burton produced quite satisfactory contracts with Dr. McRae, but Mr. McFadden wanted further delay, and produced a letter from a physician, not even dated, saying the camps would be visited at an early date, and contract furnished when details could be arranged. I insisted on something more definite, and with considerable reluctance Mr. McFadden added to the letter a promise to have his contract in your Secretary's hands within a week. This I accepted. The Magistrate suspended sentence on payment of costs by each. About two weeks later Mr. McFadden visited your Secretary in this office but did not bring any contract.

As Mr. Quibell, the Magistrate, had in the meantime been relieved of his office, there was no one to pass sentence for his persistent neglect. Mr. McFadden promised again to furnish the contract in a few days. On my return home, almost four weeks after his first promise, I found it still unfulfilled, and only on telegraphing a threat of another prosecution, by order of your Secretary, did we succeed in getting Mr. McFadden to comply with the Act by furnishing a contract.

On Feb. 23rd, at Sudbury, I laid before Police Magistrate Brodie, information for similar offences against Carney Bros. of Massey; H. Caswell, of Caswell & Anderson, Massey; B. Bahnsen, of Pine; Wm. Charlton, Manager for J. & T. Charlton, Pogamasing.

The last named had defiantly several times told me he would not obey the Regulations regarding a medical contract, and we could not make him as "the Act was defective," etc. Shortly after the information was laid, he wanted me to withdraw it, stating that the walking-boss had made a contract in January. On my calling on the doctor named, I found the statement was not correct. He had never visited the camps and no contract had been made. Mr. Kains, of Carney Bros., and Mr. Caswell appeared before the Magistrate at Webbwood on 27th Feb. and pleaded "not guilty," but having heard my evidence with that of Dr. Flaherty and the two defendants, the Magistrate said he "must find them guilty on their own evidence." He imposed a nominal fine of $10.00 and costs in each case, and instructed them to make contracts at once and forward them to your Secretary.

On the morning of 28th February, Messrs. Bahnsen and Charlton were to have appeared before the Magistrate at Chelmsford, but as their solicitor had entered a plea of guilty, the Magistrate notified me there was no necessity to hold court there, and that he was imposing a similar fine as on the day previous, viz., $10.00 and costs in each case, with instructions to at once comply with the Act.

The amount of the fine will have no effect whatever in enforcing compliance with the Regulations, and is being ridiculed by their confreres, but the intention was simply in the first place to show that the Act can be enforced, and secondly that it is the intention of the Board that it shall be.

I do not know of any other delinquents in this respect, except some small jobbers, whose employers should be held responsible for them in the future, although McFadden and Charlton asserted there were many but refused to name them.

I suggest that notice of verbal contracts be not accepted for the future, but that copies of written contracts be required, and as lumber camps are in the majority of cases in operation by Sept. 1st, or earlier, that the contract be furnished your Board by Sept. 15th, or if formed later, then within a month of its being started, and in case of non-compliance, prosecutions be started forthwith. As nearly every employer of labor admits "the Regulations are all right if enforced," it will only require a few prosecutions to bring about the obeying without enforcement. A heavy daily penalty for each day's neglect in providing a medical contract, and which could be collected on information of any complainant would, I believe, have a good effect.

Another suggestion which I make is, that in the event of neglect to make a medical contract as required by the Regulations, your Board be empowered to make the necessary appointment, the employer being held responsible for fees and all other conditions required by the Act.

March 22nd, 1906.

Report on Small-pox.

During the past quarter, the Unorganized Districts of the Province have been almost free from smallpox, requiring but little attention on that account from your Inspector, but from many points in the more settled parts of the Province, there have been reported cases of a more or less severe type, but generally, of a modified character. Most of these outbreaks were looked after by the local health authorities and kept well in hand, but a few of them I visited and rendered the assistance necessary.

1st. County of Wentworth.—Suspected cases were reported from this county during the 1st week of January. I spent two days investigating in the Townships of Glanford, Binbrook and Barton, and Village of Ancaster, and during the first day had the appreciated assistance of Dr. Roberts, M.H.O., of Hamilton. After thoroughly considering the cases seen, the conclusion arrived at was, that we had instead of smallpox, a few cases of impetigenous eczema to deal with.

During the fourth week of January I visited cases in four widely separate portions of the Province.

2nd. County of Hastings.—By request, on Jan. 22nd, I visited the Township of Huntingdon, with Dr. Eagleson, M.H.O., of Madoc, and there diagnosed several cases of smallpox. Later in the day, I met the local Board of Health, and as there had been many persons exposed in the neighborhood, and children from infected houses had been in attendance at two schools, viz., at Ivanhoe and White Lake, the necessary steps were immediately taken to have all vaccinated, and quarantined for a suitable length of time, and have the disease stamped out. Dr. Eagleson informed me that these cases had been traced from Faraday Township, where the disease had been prevalent three months ago, and from where it had spread to several neighboring municipalities.

3rd. Village of Newcastle in the County of Durham was visited on Jan. 22nd. and here I found a well marked case in about its 10th day, in the adult daughter of Reeve Parker, Chairman of the local Board of Health. This case had been reported to the M.H.O. as a case of chickenpox, by Dr. Farncomb, and he had been refused permission to make any personal investigation. No doubt there was suspicion as to the true nature of the disease, by those interested, as the house was nominally quarantined, and a "Contagious Disease" placard put up on a tree close to and facing the house, but not where it could be seen by persons approaching, nor from the street, while the father was living at his shop so as to continue at work. I insisted that there must be proper quarantining and placarding, and that the M.H.O. must not be obstructed in the proper performing of his duties, as was threatened by the patient's father, who as I before stated, was the Chairman of the Board of Health.

Dr. Anderson, M.H.O., informed me that on the previous day he had discovered several mild cases now convalescent, amongst pupils in the High School, from the adjoining Township of Clarke, that the school had been closed and steps taken to vaccinate all the children and have the building thoroughly disinfected. I may here state that four younger members of the Parker family who had been attending this school, all showed marks of a recent attack, but the rash was pretty well faded out, and the spots few as compared with the present case.

I telephoned Lt.-Col. Hughes, Reeve of the Tp. of Clarke, and learned that a proclamation ordering general vaccination had been issued three days previous, but as no M.H.O. appointed, I ordered that this defect be remedied at once, so someone with authority could act and see the regulations carried out.

Ten days later, on Feb. 2nd, by your order, I again visited Newcastle, as one Geo. Eilbeck, signing himself "a member of the Board of Health," had published a letter in the local newspaper, saying he "had on 30th Jan. visited Miss Parker by order of the local Board and that he had examined her and she had not now, and never had smallpox," etc., etc. On verifying his statement as to his visit and exposure, and finding him mingling with the general public, I placed him in quarantine, until all danger was passed. The following day another case developed in this village, and as it was quite evident the M.H.O. was not receiving the help and assistance he should have, in fact was rather being obstructed by those in authority, I deemed it expedient to appoint two sanitary policemen for the protection of the public, and to assist the M.H.O. in his duties. The efforts of Dr. Anderson, M.H.O., who was apparently zealous in carrying out the smallpox Regulations, were not appreciated, and he was shortly afterwards dismissed from office, and Dr. Hazelwood, of Bowmanville, appointed in his place.

The expense of a few dollars in stamping out the disease seemed to worry this municipality greatly, the authorities caring little for the welfare of others, if they could save their pockets from a very trifling outlay. I think the Reeve and others who obstructed or neglected the carrying out of the Smallpox Regulations under the Public Health Act, are deserving of the severest censure.

4th. Township of Clarke, Co. of Durham.—On Feb. 3rd, I visited the Village of Orono in this Township, and with Dr. Tucker, who had lately been appointed M.H.O., and Dr. Rutherford, saw several cases of smallpox in various stages, but as they had the cases well in hand, and were taking all precautions to prevent a further spread of the disease, there was nothing particular for me to do beyond acting in an advisory capacity.

5th. Township of Kincardine, Co. of Bruce.—On Jan. 26th, I attended a joint meeting of the Boards of Health of the Town and Township of Kincardine. There were no cases of smallpox reported in town. Dr. Bradley, M.H.O. of the township, reported nine cases developed, and four suspects under quarantine. The first case was recognized on Dec. 30th by Dr. McCrimmon and agreed in by Dr. Secord, M.H.O., of the town, who was called in consultation, and who has taken charge of all cases since. No new cases had developed except in houses where it previously existed, since 18th inst. Eight schools had been closed, also all churches in or near the infected district. and all meetings prohibited.

The first intimation your Secretary had of this outbreak was from London, where a lady who had been at a wedding in Kincardine Tp. on Dec. 27th, and returned home on the 29th, developed the disease on 13th Jan. I find all patients so far attacked but one, were at the wedding, and possibly that one also.

The first case was in a man who attended the wedding and had shortly before arrived from the North-west, where he says a man with much rash on him, drove him to the railway station. Placarding appeared to be considered the all important step to take to prevent further spread of the disease. No vaccination had been done, and one Sanitary Inspector was trying to attend to the wants of the people in all the infected houses, and enforce quarantine over several miles. Dr. Bradley, M.H.O., and the Board of Health promised to attend to the necessary vaccination at once, and to put on a more rigid quarantine. Much indignation was shown towards the physician in attendance on the cases, and those present at the meeting unanimously expressed the belief that he did not take any precautions to prevent spreading the disease himself; that there was no change or protection of clothing while visiting those or any other patients, etc. I advised them to consult with Dr. Secord in regard to the matter, and probably a better understanding would result.

6th. Village of Norwich, Co. of Oxford.—Here on Jan. 27th I visited two cases with Dr. A. D. Ellis. They were in the crust stage. All exposed persons had been vaccinated, and the patients effectively isolated and quarantined in their own house. The suspected source of these cases was Kelvin, a neighboring village, but on telephoning Dr. Johnston, M.H.O., he stated he had visited Kelvin and could not trace a case in either Burford or Windham within which townships it lies. No further cases reported here.

7th. Town of Berlin, Co. of Waterloo.—A suspected case having been reported by Dr. Walters, I visited this town on Jan. 30th and with him saw two cases, both young women. The first, had prior to my visit caused an element of doubt, but the weight of evidence was now undoubtedly on the side of smallpox. The other had only been discovered a few hours before, and had developed in the Civic Hospital, fortunately in a ward where only the one patient. There was no doubt in the minds of either of us about this case. No connection, however, was traceable, between these cases. Effective measures were taken to prevent further spread from either case, and in the evening I met with the local Board of Health, and advised *re* removal of patients to the isolation hospital, vaccination, disinfection, etc. The Board of School Trustees also undertook to have all children in the town schools vaccinated. Nothing further heard from these cases, so I take for granted all was soon cleared up.

8th. Village of Thedford, Co. of Lambton.—A case of smallpox having been reported from Thedford, but information not very satisfactory, I visited the village on Feb. 6th, and learned from Dr. A. J. Grant that the patient was teller in the Sovereign Bank, where he occupied a room in rear of and over the bank. He took ill on Jan. 23rd, but disease not suspected until 25th, when he was isolated to await developments, and his room-mate prevented from returning to the room, was vaccinated, clothes changed, and exposed ones fumigated, etc. Two days later, papules were out freely on the patient and Dr. Munns, M. H. O., agreeing in the diagnosis, he was removed to isolation quarters in the outskirts of the village, and precautions taken to prevent further spread. The bank premises with all books, papers, money, etc., were thoroughly fumigated for thirty-six hours with sulphur, after which all wood-work was washed with solution of bichloride of mercury.

The room-mate of the patient, I directed to be kept under close surveillance, and I believe he ultimately developed the disease, but with these cases, I understand, the disease was stampd out.

9th. Algoma District.—About Feb. 6th, a case developed in Burton Bros. lumber camp, near Garden River, and was sent into the "Soo," but immediately returned to camp by Mr. Quibell, Stipendiary Magistrate, who with Dr. McRae at once visited the camp and had it quarantined, then the men vaccinated, and appropriated the office for an isolation hospital, the firm not having provided any building as required, nor even contracted for a physician. This with adjoining camps of the same firm were reported in a filthy and unsanitary condition, but immediate steps were taken to at once rectify the neglect. This firm I prosecuted on Feb. 19th for not having a medical contract.

From one of these camps, another case turned up at Blind River, about 12th Feb. and this case I saw with Dr. Bird on 20th Feb., in isolation hospital, but as he with two companions had also visited the "Soo," as well as the Morgan Co.'s camp, and various places in Blind River, it was to be feared more would be heard from these cases. Indirectly, I have since heard that a few more cases, probably resulting from the visits of these men, broke out in both the Soo and Blind River, but were immediately corralled, and the disease effectively eradicated in a short time.

10th. Town of Bowmanville.—On March 19th your Secretary requested me to visit this town, where an outbreak had taken place, but where certain doubts had been expressed about one case. In all about ten cases had developed, extending over a month. Eight of these I saw, with either Dr. Potter, M.H.O., or Dr. Hillier. All were recovering rapidly except one, a child in the house where the previous doubtful case had been, and only at period of my visit was the rash first seen, this case I think strengthening Dr. Potter's diagnosis of the previous one.

Three or four of these cases were employees of the organ factory, who all worked close together. Two were in the isolation hospital and the others quarantined in their own homes. The health authorities were thoroughly alive to the situation, and taking the necessary steps to prevent further spread of the disease.

This completes the list of cases with which I was directly connected, but there were many other outbreaks, which were handled by the local health authorities. All were, however, of a comparatively mild type, and but few of them had ever been vaccinated amongst those that I saw, in fact none for many years. It is gratifying to report that no death has taken place during this quarter from this dread disease.

March 31st, 1906.

Laboratory Report

JOHN A. AMYOT, M.D., Director.

For the Quarter Ending March 31st, 1906.

To the Provincial Board of Health of Ontario:

GENTLEMEN,—I have the honor to present you the following report of work done in the Laboratories of the Board during the quarter ending March 31st, 1906:—

Report from Laboratory of Provincial Board of Health for Quarter ending March 31st, 1906.

County	Municipalities	Diphtheritic Swabs				Tuberculous Sputa		Typhoid Bloods		Miscellaneous Specimens	Waters		Total number for quarter
		Release		Diagnosis							Chemical	Bacterial	
		+	—	+	—	+	—	+	—				
Algoma	4						2			1		10	13
Brant	5				1	1	6						8
Bruce	7			4	3	3	5			2			17
Carleton	10		2	3	1	2	5		1			1	15
Dufferin	8					1	9	3	3			1	16
Elgin	2				1							6	7
Essex	11		1			11	15	4	5				36
Frontenac	14	22	30	15	25	10	43	5	15	12		20	197
Grey	9		2	8	8	2	13	1	3	1		3	41
Haldimand	3						2	1	1				4
Haliburton	0												0
Halton	6	2		2	5	1	1						11
Hastings	8			3	1	10	18		4			11	47
Huron	7		1		2		2	1	2			1	9
Kent	9				7	8	16	2	1			1	35
Lambton	8			3		2	4	1					10
Lanark	15	20	5	7	6	6	5	1	2				52
Leeds & Gren.	11			1	3	7	18	1	3	2		17	52
Lenn. & Add.	9					3	11		1	1		2	18
Lincoln	10	1		1	2	5	6		2	1		11	29
Middlesex	7				2	3	2					14	21
Muskoka	9	1		3	5	4	3	3	2	1			22
Nipissing	6			2			1	1	1	4		8	17
Norfolk	8				2	4	14		3				23
North. & Dur.	12			6	4	6	15	5	3	1		13	53
Ontario	4				2	2	7		2			1	14
Oxford	10				2	4	6	7	7	1		13	40
Parry Sound	8		1		2		2	2	2			7	16
Peel	9	3	1	2	3	2	2			1		1	15
Perth	9			1	3		2	1	4	1		2	14
Peterboro	12	1			4	7	14	2	3	1		2	34
Pres. & Russ.	1							1	1				2
Prince Edw'd	3	2			1		1						4
Rainy River	1				1		2						3
Renfrew	8				2	4	14	2	3			35	60
Simcoe	11			4	7	10	24	2	3			14	64
Stor., D. & G.	9				1	3	6		1				11
Thunder Bay	12		1		1	1	1	10	7	1	1	51	74
Victoria	8	1	1	5	4		1					1	13
Waterloo	14	2	8	4	5	2	27	1		6	21	31	107
Welland	7				1	1			2			3	7
Wellington	12	6		2	5	2	8	2	4				29
Wentworth	9			1			2	1	2	1		16	23
York	15	16	17	35	46	19	37	36	49	7		80	342
		77	70	112	168	146	372	96	141	45	22	376	1625

Summary of the Work done in the Laboratories during the Quarter ending March 31st, 1906.

Date 1906	Diphtheritic Swabs				Tuberculous Sputa		Typhoid Bloods		Miscellaneous Specimens	Waters		Total number for month
	Release		Diagnosis									
	+	−	+	−	+	−	+	−		Chemical	Bacterial	
January....	31	29	33	55	52	136	27	40	12	0	80	495
February....	14	20	36	59	39	109	30	46	18	7	137	515
March......	32	21	43	54	55	127	39	55	15	15	159	615
	77	70	112	168	146	372	96	141	45	22	376	1,625
	147		280		518		237			398		
	427											

During the quarter there were examined in addition 33 samples of sewage from Berlin, Ont., making a total of 1,658 specimens.

Toronto's Water Supply.

The routine examination of this water was continued. In all 71 samples on as many days were examined—22 in January, 23 February and 26 in March.

Ten, or 14.7 per cent. of these 71 show colon-bacilli, intestinal bacteria. These bacilli were found on the following dates, Jan. 15, 23, 24 and 25th, Feb. 2, 12 and 23, and March 2, 14 and 27.

This is not an unusual condition in Toronto's water. During the last two years these periodic infections have shown. The solution would seem to be filtration. The typhoid death rate is considerably above what it should be if its water supply was perfect.

Table Showing Product of two Municipal Mechanical Filters.

St. Thomas, Ont., March 8th, 1906.

Laboratory number.	Sender's number.	Where collected from.	Streptococci.	Staphylococci.	Colon Bacilli.	Colonoid Bacilli.	Chlorine in parts per million.
885	No. 1.....	Creek........................	None.	None.	None...	Present.	2
883	" 2.....	Settling Reservoir............	None.	None.	None...	Present.	3
887	" 3.....	Pump Station Tap	None.	None.	Present.	Present.	2
886	" 6.....	Fire Hall Tap...............	None.	None.	None...	None...	2
888	" 5.....	Collegiate Institute Tap......	None.	None.	None...	None...	3
884	" 4.....	Wellington St. School Tap...	None.	None.	None...	Present.	3

Dundas, Ont., March 27th, 1906.

Number of Bacteria per c.c.

Laboratory number.	Collector's number.	Where collected from.	Temperature at which cultivated.		Streptococci.	Staphylococci.	Colon Bacilli.	Colonoid Bacilli.	Chlorine in parts per million.
			37°c.	22°c.					
1248	No. 1.	Raw Creek Water........	29.000	160 000	None.	None.	Present.	None.	4
1249	" 2.	Alumnated Water, 1½ grs. to gallon	2.700	15.000	None.	None.	Present.	None.	4
1250	" 3.	Tap at Filter House	1.000	1.500	None.	None.	Present.	None.	4
1251	" 4.	Tap at Fire Hall	250	500	None.	None.	None. ..	None.	4
1252	" 5.	Tap at Braund's Drug Store	520	800	None.	None.	None. ..	None.	4
1253	" 6.	Tap at Collin's Hotel.....	1.400	500	None.	None.	None. ..	None.	4

To commence with Dundas water contained a large bacterial content. Efficient filtration in this case should not let more than 100 or 125 bacteria through per cubic centimeter.

North Bay Water and Sewage Condition.

At Dr. Hodgetts' instruction on passing through on Feb. 25th, I looked over the condition of progress of the water system and sewage of the town.

The sewers had not all been put down. The cold weather caught them before they had finished. They encountered considerable difficulty in the excavation on account of quick sand. There was five or six weeks work yet to be done. The septic tanks were completed, well isolated, and appeared well constructed. The effluent pipes had been placed out into the lakes. They of course had not yet been connected up with the sewers.

The water-main has been constructed nearly out to Trout Lake. It had also been delayed. There was some 4 or 5 weeks' work there yet to do also. The power-house was finished. It can be seen at the side of the lake below the railway. The intake will here be in a bay a few hundred yards across and there a large lumber mill is situated and not far to the east a large summer hotel, with cottages along the shore. So far nothing has been done to see that no infection comes from these sources which I consider worth looking after.

New Liskeard Water Question.

New Liskeard has under consideration at the present moment a public water supply. The town has a population of about 3,500. The prospects are that this will in the near future be doubled, it being a distributing centre for all that new country.

Three sources of supply present themselves there. Lake Temiskaming in front of the town. The south branch of the Wabi River at a falls some 6 or 7 miles to the south west of the town by gravity, or two springs, by pumping to the south-east of the town about 2 miles distant.

Lake Temiskaming Source.

The town is situated at the mid-shore of a crescent shaped bay, about three or four miles wide at its outer end. Running through the town is the

Wabi River draining the now rapidly filling famous clay farm land. This bay thus receives much sewage. The water is nearly always turbid, (the Wabi is a mud river,) especially in the summer time. The water in the bay is altered very much in depth by the directions of the wind.

In short the water is colored, turbid, sewage polluted and varies much at seasons in these respects.

It would not be a safe source without an efficient filtration.

The South Branch of Wabi Source.

The point at which it has been proposed to tap this river is to the south-west of Bucke township. There is some farming done here and there above the source. Much prospecting is being done there just now also. It is quite possible that in the near future it will be the centre of much development and may be infected thereby. Through Mr. Chipman, assistant, I have found since that the cost of bringing this water over to New Liskeard will be much more than at first thought, for the reason that the main will lie nearly level for some distance, thus necessitating a much larger pipe than at first supposed. He considers the cost nearly prohibitive for the town's finances at the present time and to make things worse two samples of water taken on as many occasions were infected with colon bacilli. This might be further investigated.

Two Springs to the South-east.

These springs originate in the low ground at the foot of a lime-stone hill. They are about a quarter of a mile apart. The one closer to the town is the smaller and flows about 500,000 gals. a day. The larger one gives nearly 1,500,000 gals. The water looks nice and is said to be always so by those about. The mayor of New Liskeard accompanied me and vouches the accuracy of this. There is a serious objection to the second spring. It is that it bubbles up in the hollow in a field. Into this hollow a couple of small ravines drain. Into one of these ravines there runs practically all the drainage from a large farm house and the accompanying stables and barns, and this at a distance probably of not more than 150 yards. This of course could be got over by buying this farm outright. Mr. Chipman feels very certain that over a million gals. per day can be got at all times from this source. This source will of course mean pumping and if properly protected should be a safe one.

Ingersoll Water.

At the request of the Water Works Company of Ingersoll, a further series of samples, this time from the gathering basin at the head of the intake pipe, were examined. The following table gives graphically the results of these examinations.

Date 1906	Laboratory Number	Where collected from	Streptococci	Staphylococci	Colon Bacilli	Colonoid Bacilli	Chlorine in parts per Million
Feb. 3	408	Gathering Basin................	None	None	None	None	3
" 5	422	" "	None	None	None	None	2
" 6	451	" "	None	None	None	None	3
" 7	452	" "	None	None	None	None	3
" 8	467	" "	None	None	None	None	3

The ground was well frozen over during all the time these samples were collected.

This report is an addendum to the report given at the last quarterly meeting of the Board. The water company thought they would be more satisfied if the other water from the head of the water-main were taken. As the ground and everything about was frozen no pollution got into the pipe. But this says nothing for the rest of the year when all is open and cattle pasture in the neighborhood and when the freshets carry the drainage from the houses in the water-shed.

Cobalt Water and Ice.

At the direction of Dr. Hodgetts, a visit was made to Cobalt, New Ontaria, on Tuesday, February 27th, 1906.

The population is variously estimated at from 1,200 to 1,500, much of it a floating one. The town is an unorganized one.

A Justice of the Peace and a constable represent the law.

The houses are for the most part temporary shifts built on top of the ground, with very little reference to streets, of which there are no fixed ones. The houses are placed as close together as possible and in all directions. The land is becoming very expensive. Only the day before my visit, a small lot large enough for a house without a yard sold for $1,500.00. Other properties are being held for like figures.

The water is got from a couple of very questionable springs amongst the houses and through holes in the ice from Cobalt Lake. Previous analyses of these waters have shown all of them to be infected with intestinal bacteria, showing the liability of them to typhoid infection if other intestinal discharges should have typhoid bacteria in them, with of course other diarrhœal causative agents as well. There have been five cases of typhoid in the district since Christmas, three of which have probably been infected elsewhere, but the other two seem to have got their infection in the town.

The settlement is scattered over three more or less parallel ridges radiating somewhat to the north. Nearly one quarter of the houses at the present time drain towards Cobalt Lake, which has an area of about 50 acres. Its infection is thus accounted for. The other three-quarters drain into the valleys between the ridges. The ridges are covered with houses and the valleys are filled with them. There is one water closet about to five houses. Some of them seem filled to above the seats, and otherwise in a most filthy condition. Those houses having none have discharged on the ground. Garbage, wash water, urine and faeces all mixed together in frozen heaps out in the open, on top of rock, practically bare in its greater area. The cold has been steady so far and all is frozen, but when the thaws come the accumulations will all be washed into the valleys and the lake, polluting all the water sources. If nothing is done to correct the evils before the thaws, then in all human probability there will be a severe outbreak of disease in and about the settlement.

The township is now being organized, and notices of nomination and election of township officers are out. The following recommendations would seem to be indicated.

1st. That each "house-holder" be directed to clean up all the debris about his place, and build a proper outhouse of the dry earth type.

2nd. That the township get the right to some piece of property near the town where the gathered up material might be dumped, preferably burned up. All the property is taken up but it is quite possible that a suitable site could be arranged for with some of the mine owners.

3rd. Under the circumstances a daily gathering of refuse should be established, the man gathering to be an officer of the town. It has been suggested that the town itself supply at the minimum cost a uniform kind of dry earth receptacle for the dry earth closets.

4th. The settlement should then at the earliest possible date make arrangement for an unquestioned municipal water supply—possibly from "Clear Lake." None of the waters in the town or in the immediate neighborhood are safe and especially is this so with reference to the springs in the town and of Cobalt Lake.

Some ice had been cut from Cobalt Lake. This water is questionable and of course the ice also. Those who had cut were instructed not to use it except for cooling purposes. As far as could be found only two had cut this ice, a general grocer and a butcher. Both understood that their cut is not to be used except for cooling purposes. They had already stored what they had cut. Future cutting was prohibited. A better supply could be got with only a slightly longer haul from Lake Sasaginaga at the back of the settlement. This Lake, as well as "Clear Lake," is situated much higher than the town and there are practically no habitations about it.

Laboratory Report on Samples of Sewage Collected by the City Engineer's Department of the City of Toronto

From the below named sewers of the city at their termini during 1905, in parts per million.

NOTES

Review of Vital Statistics of the Year 1904.

By CHAS. A. HODGETTS, M.D., Deputy Registrar-General, Chief Health Officer of Ontario.

Presented at the Meeting of the Board, held July 6th, 1906.

The completion of the report upon the vital statistics for the year 1904 recently prepared by myself as Deputy Registrar-General affords the opportunity for a few comments thereon. The estimated population for the year is 2,203,968.

Births. These numbered 50,265, including still births which numbered 1,690; the birth rate being 22.8 per thousand of the population, an increase of 0.7 per thousand over 1903. The birth rate in the rural districts being below the Provincial average.

The number of children born out of wedlock was 798, which was 16 in excess of the previous year and 15.8 per thousand births registered.

Marriages. There was a slight falling off in the number of marriages registered, the total number being 19,789, or a rate of 8.9 per thousand of the estimated population.

Deaths. The death rate for the year was 14.1 per thousand of the population, the total being 30,920, which is an increase of 0.7 per thousand in excess of 1903.

Comparing the deaths by age groups as registered during the past eight years, it will be observed that the increase has been constant with the exception of the years 1898 and 1900 in the case of infants under one year, the number for 1904 being 6,907; 724 in excess of what it was in 1897. In the group for 1 to 5 years there has been a gradual decrease—from 2,221 in 1897 to 1,612 in 1904, indicating a lessened danger to life in children, a fact which is still further emphasized in the groups 5-9, 10-14 and 15-19, where the decreases have been 241, 84 and 79 respectively. From the ages 20 to 39 but little difference is noticed in the number of deaths, while after the age of 40 years the increase is gradual as follows: 40-49, 330; 50-59, 421; 60-69, 698; 70-79, 931; until in the last group of 80 and over the largest increase is found, being 1,204; in each case the comparison is made with the returns of 1897. The figures would indicate that the deaths are as might be expected, gradually increasing amongst those who were the early settlers in the Province, the hard work and privations of this Province apparently having had but little effect in shortening their life's span.

Before leaving this subject I would point out the necessity for greater attention being given by this Board to drawing public notice to the growing need which exists for a better and more general education of the public in the nursing and in the care of infants. Too often is it found that the life of the first-born is sacrificed during the early months of its life by reason of the lack of knowledge on the part of the parents in the care necessary in the feeding of this valuable portion of our population, and a lack of knowledge as to the care in toilet and personal hygiene of these dear little infants. The same attention given by the parents as to how to bring up the baby as is given by them to the rearing of the young chickens or the thoroughbred calf or other divisions of the barn yard particularly as regards feeding, would be followed by equally good results if the child life were made a portion of the study of young women and men of our Province.

The people of this province have yet to realize the importance of this branch of education and that no false modesty must be permitted to exist in regard to it. The study of the infant life is of more importance than animal or vegetable life, or the making of butter, the baking of bread and the all-devoured American pie. The young women of our cities must be taught how to feed, nurse and clothe "the baby," and be shown how much more important to the state is this "delicate?" subject than the feeding, fondling and toilet of the pet dog or cat, or the fascination of the gambling associated with bridge whist and other like social fads.

This Board should impress upon the Legislature, upon the educationists, upon the clergy and the thousands of our church going population, yes, even the upon the medical profession, the growing need of this neglected, nay, almost, I was going to say, forgotten subject being taken up and given a more prominent place in our nation's life. The care of the life of each baby born in our beautiful province carries with it a responsibility shared in by each and all—legislator, clergyman, college professor, teacher—and each death due to lack of knowedge on the part of the parents in the proper rearing of the babe is due more or less in part to failure on their part to see that the youth of Ontario have received that information, for it cannot come by instinct; this is an abstract thing, an attribute of the brute—it may come by experience, but it can and should be obtained by compulsory education.

Where in this wide world is there better stock than in the young men and women of this province? Yet where is there less attention given to the raising and fostering of the offspring of this fine type of humanity than in this same province? Up to the present all is left to chance and the result is to be found in the returns just referred to. We spend thousands to bring out a very questionable young stock to this country from the crowded centers of Great Britain; better if our young married couples were instructed in the importance of raising up for themselves children of their own, the very bearing of which would give to them better health and longer life than the one now most sought and planned for, namely that of barrenness which permits the indulgence to the full of selfish pleasure and worldly enjoyment.

Too often we fail to grasp the importance of the child to the parents and the state—the potentialities contained within its beautiful baby form—we forget the delicate anatomy is the temple of that which shall survive the crumbling of that to which no other created thing can compare; we lose sight of the fact "the baby" is invaluable and as a consequence of this and the prominence given in our educational system, in our Legislature and commercial interest to art, science, agriculture and all that relates to our material welfare and social comfort we are paying a penalty year by year which, if not corrected, will lead to national ruin similar to that which befell the nations of Greece and Rome.

A further study of the returns, particularly as they relate to the still births in the province, only accentuates the need of some such step as that suggested. Steadily year after year the number of still births registered is mounting up, and I am satisfied that the figures are not representative of the actual number of such children born in this province.

If the loss of infants is serious and calls for an education of the men and women of this province in the proper methods which should guide their feeding and personal hygiene of this the most valuable of all our country's assets, what should we say as leaders in preventative medicine of the still more marked increase of the number of still births. The figures as taken from the Registrar-General's Report, are as follows:

Year	Population	Total deaths	Deaths under 1 yr.	Death rate per 100,000 under 1 yr.	Total death rate per thousand of the population	Still births
1897	2,257,378	27,633	6,187	274	12.20	435
1898	2,279,929	26,370	5,975	262	11.50	532
1899	2,302,705	28,607	6,342	275	12.40	419
1900	2,325,712	29,494	7,163	307	12.60	578
1901	2,184,144	29,608	6,543	299	13.60	780
1902	2,205,965	27,864	6,003	276	12.60	823
1903	2,198,692	29,664	6,700	304	13.40	933
1904	2,203,968	30,920	6,907	313	14.1	1,690

The gradual increase from 435 in 1897 to 1,690 in 1904, with the exception of a slight decrease to 419 in the year 1899, means surely more than that this large loss has occurred annually from natural causes only, and I cannot but express the opinion that if all the still births were registered the figures would be greatly in excess of those given, and if it were possible to give in statistical form the number of abortions that have occurred in the same period of time we would have figures which would be somewhat astounding to the general public. But what does this aggregation of figures mean? Is this loss to be ascribed to natural causes alone—have all the precious lives been lost to this one Province of the Dominion of Canada through physical defects or constitutional or functional diseases on the part of the parents, or through mere inanition of their offspring? I would that I could confidently state it were so, but knowing something of what I may call the social degeneracy of the present day, it is in my opinion time that this Board directed public attention to the facts and suggested some means whereby the growing evils surrounding the marital relations were brought more prominently before the public and our men and women taught their duties each to the other and both to the state in respect to the raising of offspring.

It is time we reverted to the old time idea that the destruction of young life at no matter what stage in its development, except for well grounded reasons, results disastrously to the mother and is as criminal on the part of those who participate in it as it is demoralizing to our social life. If our Canadian race of women were rickety and delicate in character as are many of the women found in the crowded and poor centres of Europe there might be some excuse for this silent slaughter of the innocents, but in my opinion such extenuating circumstances cannot be generally advanced, hence it is with feelings of remorse and regret I direct the attention of this board to the facts just submitted, with the hope however that in directing public notice thereto something may be done to correct the evil which with a malignancy as subtle and yet as certain in its results and as fatal as any disease known to the physician or surgeon, and, what is still worse, demoralizing to the state.

The evidence of this modern slaughter of the innocents becomes apparent from time to time. As the coral reef in the ocean indicates the silent work of the coral insect so the finding of the dead body of a newly born infant in some out of the way place or the many instances of infanticide unearthed by the police are but the outcroppings of the social evil; this is the so-called criminal side of the question—the least extensive; the perpetrator of each offence is denounced by society, the press and the public, while being hunted by the police, but what shall we say of the respectable (?) the non-criminal cases which constitute an unnumbered roll and coupled together with the destruction of human embryonic life which to-day is freely and indifferently indulged in by all classes of the community an evil hydrea-headed in character which is greater than the drink question and more far reaching in its effects than all other social evils put together, one claiming the attention of the pulpit, the press, the medical profession and the innumerable societies of men and women having for their object the bettering of mankind, who must without any false modesty meet the evil and deal with it without gloves.

The figures of the group of diseases of first importance to this Board, viz., the communicable, in the order of mortality are as follows:

Diphtheria and Croup	608
Typhoid Fever	482
Influenza	331
Scarlet Fever	163
Whooping Cough	109
Measles	30
Smallpox	3

It will be seen that diphtheria continues to be the most fatal of the contagious group, and a further study of the returns shows it to have prevailed generally throughout the Province, a statement which can also be made of influenza. Enteric fever, however, comes a close second in this respect, no deaths having occurred from it in the County of Peel; this, however, is not convincing that cases of the disease were not present in the county — the type may possibly have been of a mild character and recovery the rule, and a study of this may with interest be made in the returns of 1905 now being collated.

The Board will note with pleasure the decreased mortality in the case of scarlatina, the deaths dropping from 580 in 1903 to 163 in 1904. a fact which is largely attributable to the better enforcement of the regulations of this Board whereby the epidemic prevailing in the former year was stopped in its onward progress, and not so much to its lessened virulence.

As tuberculosis is not grouped with the foregoing diseases in the report of the Registrar-General, the deaths being given under the sub-group heading of "Tuberculosis and Scrofula," they will also in this report be dealt with separately and for convenience of comparison the following table taken from the report is herewith submitted.

Table showing the number of deaths from Tuberculosis in Ontario.

From 1870 to 1904 inclusive.

Year.	Population.	Number.	Year.	Population.	Number.
1870	Not stated.	886	1888	2,148,971	2,551
1871	1,620,851	1,049	1889	2,148,971	2,417
1872	1,650,111	1.308	1890	2,161,971	2,503
1873	1,679,371	1,420	1891	2.122.716	2,379
1874	1,708,631	1,295	1892	2,146,020	2,592
No returns	1,737,891	....	1893	2,167,460	2,552
1876	1,767,151	2,315	1894	2,189,116	2,379
1877	1,796,411	2,188	1895	2,211,101	2,472
1878	825,671	2,053	1896	2,263,492	2,922
1879	1,854,931	2,104	1897	2,257,378	3,154
1880	1,884,200	2,197	1898	2,279,929	3,291
1881	1,923,610	2,446	1899	2,302,705	3,405
1882	1,923.610	2,591	1900	2,325,712	3.484
1883	1,923,610	2.667	1901	2,184,144	3.284
1884	1,923,610	2,506	1902	2,205,965	2,694
1885	1,923,610	2,499	1903	2,198,692	2,723
1886	2,115,971	2,573	1904	2,203,968	2,877
1887	2,115,971	2,556			
			Total	....	79,546

These figures show that 79,546 persons have died of tuberculosis in 34 years since 1870, the returns for 1875 being omitted. That this total, large as it is, does not correctly represent the actual number of deaths that happened I am convinced, for it is quite apparent that the returns of the first five years of the group, viz., 1870 to 1874 inclusive, are far short of the correct figures, a sudden increase being noticeable in 1876, and again in the year 1902; a sudden drop of close upon 600 indicates not so much a decline in the deaths from consumption as it does that many persons suffering from consumption and dying that year were stated to have succumbed from other and perhaps secondary causes. The reason for this drop may possibly be due to the public having taken alarm, and it was not fashionable, indeed it is considered by many a disgrace even to suffer from, leave alone die of, this contagious disease. The meagre knowledge acquired by the public regarding consumption has caused many to consider it a personal and family reflection that a person is afflicted with this disease, and this in my opinion accounts largely for the sudden drop in the returns, for there has been no corresponding decline in the total returns, and a comparison of 1903 and 1904 with a gradual increase indicates the slight change in public opinion, and I feel certain in a few years the number of deaths will reach to these figures.

It will, of course, be asked what of the good work done on behalf of the consumptives of this Province; is it not good and therefore must it not affect the mortality returns? To such interrogators I would say the work is good, but so few deaths have so far been prevented thereby that the result is not appreciable, particularly to the lessening of the deaths by nearly six hundred, and it will not be until the municipalities of this Province get to work and by the continued efforts of sanatorium, dispensary, day camps and home nursing that appreciable results will be noticed in this regard.

Before leaving this subject I would draw attention to the fact that the counties with the highest death rate are those contiguous to the St. Lawrence River. Leeds, Grenville, Dundas, Stormont and Glengarry, counties whose altitude is the lowest perhaps of any in the province, the only exception being that of Thunder Bay where the death rate was 228 per 10,000.

An analysis of the returns, however, showed the following to be facts: of the 29 deaths from tuberculosis 11 were of foreign birth and 7 Indians, leaving 11 deaths among the native born white population, which reduced the death rate to 86 per hundred thousand.

Your attention is directed to the increased number of deaths from the various forms of cancer; the 1,253 deaths, 97 in excess of 1903, were distributed over every county and district in the province. In this connection it would be advisable for the Board to issue a circular to the medical profession with a view of ascertaining the prevalance of cancer in its several forms and as to its distribution in the human system.

The deaths in the groups of diseases of the nervous system totalled 3,694, or 405 in excess of 1903, 203 of this increase being ascribed to paralysis; the figures indicate an increase in deaths from this cause.

The deaths ascribed to diseases of the circulating system were 2,367, and 56 per cent. of these were persons of 60 years of age and over, and 75 per cent. of this number were due to organic disease of the heart.

There were registered 3,252 deaths from diseases of the respiratory system, 1,738, or 53.4 per cent., being due to pneumonia. To permit of a better comparison of the figures showing seasonal and geographical distribution of this disease, I would recommend the placing of this disease on the list of notifiable diseases, a plan which has been already followed in several of the adjoining states.

The following figures indicate the severity of this class of diseases at the three chief age groups of life:—

Under one year	625	30 per cent.
Over one year and under five	341	
Sixty years and over	1,331	40.9 " "

giving a total of over 70 per cent. of all the deaths in these three groups.

The digestive group includes notably diseases of the stomach and alimentary canal, but troubles of a surgical character such as appendicitis, hernia and iliac abscess are also included, of the 2,594 deaths 852 were infants under one year, the cause of death being chiefly infantile diarrhoea. Of the disease of a surgical nature the returns do not show in how many instances surgical measures were adopted.

Medical Inspector's Reports.

By R. W. BELL, M.D.

Presented at the Quarterly Meeting, held July, 1906.

Report *re* Diphtheria in London.

The prevalence of diphtheria in London, being reported to this Department on 26th June, I proceeded thither next day to investigate.

I at once called on the Secretary of the Local Board of Health for information, but he could not give me any, as the cases are reported to the M. H. O.

Next, calling on the M. H. O., I had only been in his office a few seconds when it was invaded by one of the City Physicians who is an Alderman and Member of the Board of Health.

Seizing one of the M. H. O.'s record books, he placed it before me and proceeded to point out entries or lack of entries which he thought indicated neglect of duty on the part of the M. H. O. These were promptly denied by the M. H. O., who I learned had the previous day laid an information against this same physician for neglecting to report a case of diphtheria. Directly contradictory statements as to their personal actions were made by these two gentlemen, but as the verification of some of the statements was still pending before the Police Magistrate, I refrained from any opinion as to the merits of their personal squabble.

I learned from the M. H. O. that there had been reported in April 19 cases of diphtheria, in May 19 cases, and in June to date 17 cases. That there are at the present time in the Isolation hospital 14 cases, and outside three cases in quarantine.

I also learned that it has been customary amongst the London physicians on diagnosing a case of diphtheria, to at once send it to the hospital, the M. H. O. being notified by telephone only. This, I fear, has led up to the present personal unpleasantness, leaving the way open for contradictions, which the formal notice required by the Public Health Act would have prevented.

I was further informed that the diagnosis is seldom verified by the examination of swabs before the patient is sent into the hospital.

Through this neglect, there is now a dispute as to whether a case recently sent into the hospital is diphtheria or not, and if not, he is the victim of unnecessary if not criminal exposure.

The M. H. O. admits that no effort is made to carry out the requirements of Clause 8 of the Regulations re Diphtheria, for the examination of children in school rooms where diphtheria has occurred.

From various sources I am led to believe that there is considerable friction amongst a number of medical men in the City, and between a number of them and the present M. H. O., which doubtless renders it more difficult for him to perform his duties satisfactorily, and probably makes all parties more or less indifferent towards assisting each other, and as a result, the requirements of the Act not being promptly and faithfully carried out, possibly the public become the sufferers and disease is unnecessarily spread.

I urged that personal animosities must not be allowed to interfere with the enforcement of the Public Health Act; that proper formal notice of contagious diseases must be given, but that an early personal or telephonic message will be appreciated, so prompt action can be taken.

Possibly a little more personal attention to and investigation of cases reported, by the M. H.O. in addition to that of his Sanitary Inspectors, might be useful in getting at the primary cause, and hastening the stamping out of outbreaks of contagious diseases.

Report *re* Scarlet Fever in the Township of Morris, Etc.

A report that there was an outbreak of Scarlet Fever in the Township of Morris, County of Huron, not being satisfactorily dealt with, resulted in a request from your Secretary that I should visit the locality and investigate. On May 23rd I drove across the Township from Wingham to Brussels, via Belgrave, and interviewed Dr. Hamilton, M H. O., also several physicians in the towns named. Nothing was known at Wingham of any cases in that neighborhood.

In Brussels there were two or three cases, but all quarantined and properly looked after. Dr. Toole, M. H. O., assured me he would attend to the schools as required by the Regulations for Scarlet Fever.

At Belgrave, Dr. Hamilton, M. H. O., for the Townships of Morris and East Wawanosh, told me he only knew of one case at present in Morris, that the patient was convalescent, the house placarded and family quarantined. He, however, had reports of two cases, last 28th December, and another on 3rd March. He also on May 3rd, had a case in his own practice in East Wawanosh. All, he stated, had been properly isolated and quarantined, and every precaution taken to prevent the spread of the disease by disinfection of houses with formaldehyde, bathing of patients with bichloride solution, etc.

Driving on toward Brussels, I called to see the present known case at Mr. Bradshaw's, and found a second case had developed. These were children aged 7 and 11 years, both moderately ill. The placard on the house was a piece of a pasteboard box, on which apparently the words "Scarlet Fever" had been stencilled, but by a few days exposure to rain and weather were obliterated and the card useless as you can see, I having brought it away with me as a curiosity.

The family complained that they were in quarantine, but no one appointed to attend to their wants or carry messages, and as a result, the services of a physician being required during the previous night, Mr. Bradshaw had to go in to Brussels himself.

I was here informed of another family a mile or two away, where there were said to be two cases but no doctor had been to see them.

From all I could learn there had been 8 or 10 cases within a limited area, and I believe traceable from one to another, with prospects of more developing I feared there had not been effective disinfection and isolation of the cases, and also that children from infected houses had been attending school.

I was also assured that members of Mr. Bradshaw's family had been selling butter on Brussels market, the previous week, and the family of the other suspected cases had been to church in Brussels the previous Sunday.

I at once communicated all this information to the M. H. O., at Belgrave, with a request that he make further thorough investigation, also placard properly, quarantine effectively, stop the people from infected houses going to town, put on Sanitary Police and have necessary wants attended to, close the school and have it thoroughly disinfected, also have all children examined daily as required by Clause 7 of Regulations, in fact to take more prompt, active and immediate measures as required by the Public Health Act to stamp out the disease, as there had evidently been a laxity in dealing with it.

Report *re* Smallpox.

During the past three months smallpox has been rather prevalent, particularly in the older settled sections of the Province. In many of these cases the local health authorities have dealt satisfactorily with it, while in others I have had to go to their aid and assistance, sometimes to aid in diagnosis and at other times to advise and assist in enforcing more effectually the regulations.

Fortunately no fatal case has been reported, but the same carelessness in diagnosis so often spoken of in previous reports continues, confounding it with chickenpox, or calling the rash "Cuban itch," "skin disease," or "grip rash," etc. In some cases I believe the true nature of the disease is suspected, but it is made light of and called by some other name, so as not to inconvenience the friends by quarantine, and with the hope that it may pass away undetected by others, but this is rarely the result and as it spreads it is recognized sooner or later, to the discomfiture of those who had kept it hidden.

The mild type of the disease increases the reluctance to vaccination even amongst those who believe in its efficacy. Advantage of this is taken by the anti-vaccinationists to push their propaganda. My experience during the past three months, however, is worthy of note. I visited ten different municipalities, with about sixty cases, and of these I saw about forty. After diligent enquiry I could not learn that a single one of these sixty patients had ever been successfully vaccinated, while those of their friends who had been even greatly exposed to the disease, but who had been vaccinated, invariably escaped it.

A detailed account of an outbreak on John Island with its successful clear up, affords a grand object lesson as to the efficacy of vaccination. A short report as to the outbreak in each of the other places visited by me may not be without interest.

1st. John Island. A telegram having been received on Sunday, April 9th, from Dr. Cook, of Cutler, saying there were five cases of smallpox on John Island, which lies a few miles off the north shore of Lake Huron, I hastened off on the midnight train, reaching Cutler about 4 p.m. the next day, and accompanied by Dr. Cook, I immediately, in a violent rain storm, drove across on the ice seven miles to the Island. Here I found the Moulthrop Lumber Co. have a large sawmill, with Mr. McEwen as manager. As the mills had not started operations for the year, only a few men were at work preparing for a start in two weeks. About twenty houses on the island are occupied by the married employees and their families, making a population of a little over 100 all told at this season of the year. The dwelling houses about 30 or 40 feet apart, form two rows with a street between, while the boarding house for single men stands only a few yards away. The school close by is attended by 24 or 25 children. One family came here from some place in Michigan about five or six weeks before, and they now admit there were several cases of smallpox in their immediate neighborhood before leaving there. Two children in this house showed signs of a recent attack, although the crusts were off, but another child and the mother had the rash well out. These people had kept their house pretty well closed and neighbors out, ostensibly because they were painting floors, etc. The fifth case had recently developed in an adjoining house in a little boy who had been at school and playing close by.

Dr. Cook, who had been over to the Island on Saturday and again on Monday, had already vaccinated eighteen persons, while some others had refused to be vaccinated, or to allow their families to be vaccinated, even threatening violence if attempted. That night I sized up the situation, and early next morning with Dr. Cook visited every house and person on the island, and vaccinated all who could not give proof of recent successful vaccination—39 that forenoon—which with 18 done during previous three days made 57 in all. The objectors of the previous day now submitted without a word. Most of the married men with their families were foreigners, and only in Canada three or four years. They all had certificates of successful vaccination on ship-board, or recently in their native countries.

I placed the island in quarantine, and forbade any one to leave it until the quarantine was raised, except the mail carrier who made a daily trip to Cutler. Outgoing mail was to be disinfected, and nothing received from the infected families. As the ice was about breaking up, my trip back being the last with horses for the season, there was no ready means of reaching the main shore, which aided much in making quarantine effective. Mr. McEwen, Manager of the Company, being anxious to get the disease stamped out, decided to postpone the opening of the mill for a further two weeks, and so aid in preventing its spread by giving time to get all cleared up before the extra men arrived for the season's work. This action we highly appreciated, although it was as much in the interest of the company as of the general public. I left Dr. Cook in charge, he undertaking to go backwards and forwards as best he could during the breaking up of the ice.

Later, Dr. Cook reported that he had vaccinated four more, making 61 all told on the island, 60 of these were successful, the one failure being repeated on the 9th day with a good result. The outbreak was confined to the five cases first reported, which I attribute to our speedy and successful vaccination of all persons exposed, or who could not entirely avoid exposure. Within four weeks the infected houses and clothing were thoroughly fumigated, clothes boiled, patients received disinfecting baths, and all released from quarantine. I think I may justly feel proud of our success in this case.

2nd. Flesherton. Smallpox having been reported from Flesherton and Township of Artemesia, in County of Grey, and advice asked for regarding it, I visited the locality on April 27th, and with Dr. Carter, M.H.O., saw one of the cases in the village and confirmed his diagnosis. Later I conferred with him and several members of the local Board of Health. As there were several cases in the township, I advised having all the children in the schools immediately vaccinated, a proclamation also to be issued by the Council for general vaccination, a rigid enforcement of quarantine and isolation of all cases, removing them to tents if possible, with thorough disinfection of houses and clothing, etc., on termination of the cases. Dr. Carter says none of the developed cases had ever been vaccinated.

3rd. Township of Puslinch, County of Wellington. Cases having been reported from Puslinch without proper quarantine, I went to Hespeler on May 7th and there learned that smallpox existed about three miles out. Visiting the locality, I found two cases, one having come from Preston over three weeks before, and now convalescent and out of doors, the other his brother who visited him but developed the disease in a neighboring house, his employer also acting as a messenger for the household of the first patient. Both patients were now in the same house but the house from which the second case had gone several days before had not yet been disinfected. Another family near by had also been exposed but no effective quarantine had been imposed. Placards were up, one of them only placed that morning, written with a lead pencil and scarcely decipherable. Fortunately this group of three families were pretty well isolated, although the head of the third house was working in Galt, and had been sent home to quarantine the day I was there. A mischief maker in the shape of a half quack doctor living in the locality, I was informed had told in Hespeler that he had examined the cases and there was no smallpox about them. This he denied to me, but in any case I left him in quarantine as I was satisfied he had been exposed. Proceeding to Morriston in this same township, I interviewed the Reeve, Clerk, and another member of the Board of Health, also Dr. King, M.H.O. There had been no meeting of the Board of Health and no sanitary police appointed since the outbreak. There had been great laxity, apparently to save expense to the township, and very great annoyance was expressed towards the town authorities and physicians in Hespeler who were blamed for notifying the Provincial Board of Health about the negligence in connection with these cases. I advised more attention to vaccination, insisted on proper placarding and effective quarantine, the appointment at once of at least two sanitary police for constant duty until all cleared up, with thorough and efficient disinfecting.

The Hespeler doctors and authorities were very pronounced in their statements *re* the negligence and carelessness of the Puslinch health authorities in dealing with these cases, as their town was the one most likely to suffer. Before returning home I visited Preston from which the first cases came, and Galt, where one of the exposed persons had been working, but got no trace of any cases in either place.

4th. East Toronto. On June 9th, with Dr. Walters, M.H.O., I visited a case which had been brought to his notice for the first time the previous evening, and diagnosed without doubt a case of smallpox. This patient had been seen on April 28th and 29th in the prodromal stage by another physician who did not then recognize smallpox, but having heard a day or two ago of the disease where her husband worked, he became suspicious and again visited the case to find the remains of the rash, and then reported it to your Secretary, resulting in my visit. The rash was dried and crusts off, but desquamation not complete. She described very typical prodromal symptoms and also typical rash, which she said her husband also had shortly before. He worked in a wholesale fruit store, where she stated there had been similar cases both before and after his. Dr. Walters at once took effective measures to prevent further spread.

5th. Townships of Seneca and Glanford. With Dr. Arrell, of Cayuga, M.H.O. of Seneca, I drove out from Caledonia on June 13th and visited three families, and saw fourteen cases of undoubted smallpox. Dr. Arrell reported twenty-three cases in the township, and all were well in hand, but unfortunately some of the earlier cases had been pronounced chickenpox, and were not reported to the M.H.O., thereby permitting the disease to spread. In the adjoining Township of Glanford the disease had developed in one family, but it was under strict quarantine. All necessary precautions to prevent further spread were being taken in both these townships, the former of which is in Haldimand and the latter in Wentworth.

6th. Village of Cayuga. On the evening of June 13th, with Dr. Arrell, I visited a patient, a boy seven years of age, in the outskirts of the village, This case had been seen earlier in the day by both Drs. Arrell and Snider.

The boy had had a rash out for about four days, but as it had all been scratched and vesicles ruptured, there was not much information to be gained from its appearance. After close questioning of the child and parents, I concluded the evidence was much stronger in favor of smallpox than chickenpox, and therefore advised its treatment as such. There were no other cases in the village or immediate neighbourhood, but as this village is in Seneca Township where the disease is prevalent, there is every probability the infection came from there. The case was mild and well isolated, so the further spread could be easily checked. None of the cases in the township or village had ever been vaccinated.

7th. St. Thomas. With Dr. VanBuskirk, M.H.O., I visited the Isolation Hospital on June 14th, and there saw eight cases of smallpox, with Dr. Leitch in constant attendance upon them. They were all able to be up and out in the open air. An adult female within three weeks of confinement was the worst case and was well covered with rash. There was one other adult female, while the remainder were children from an infant to 15 years of age. The first case was sent in and was persistently called chickenpox by the M.H.O., but I was informed five other physicians pronounced it smallpox, which it certainly was. The school attended by these children had been closed, and will not be opened until after the holiday season. The M.H.O. was visiting the families whose children attended this school to find out how many were willing to be vaccinated. I advised him to hasten and get them done and not waste time over a preliminary canvas. These cases are traced to a visitor from Tp. Dunwich, and from there to Fargo, a few miles further west, and it is said that a case has been traced back to Caledonia. The sanitary inspector is very active, and I believe furnishes valuable assistance to the health authorities. None of the patients in the hospital here had ever been vaccinated.

8th. Township of Dunwich, County of Elgin. In this Township there had been ten or twelve cases distributed over the past three months .Several of these I saw on June 15th with Dr. Crane, of Wallacetown, M.H.O. for the township, who kindly gave up most of a day to driving about and assistin my investigation. Medical assistance had not always been called in, and so the disease had spread, but unfortunately that assistance does not always check it. I came across here one family where a strong acetate of lead lotion and afterwards coal oil had been freely rubbed on the rash for several days. Later a physician was visited who pronounced the disease "itch," and prescribed an ointment for its cure. Several of the cases were cleared up and houses disinfected, but some difficulty was being experienced with others who tried to prevent proper disinfection and quarantine, not admitting smallpox was the disease. I have reason to believe that my visit and pronouncement on the cases is likely to have a good effect and be of assistance to the local Board of Health and M.H.O.

With Dr. Crane I visited both the High and Public Schools in the Village of Dutton, and located a child from one of the infected families, in fact one who had had the disease herself, in the public school. She was a desk mate with a child from a family living two or three miles north of the village, where three members of the family had been affected with a rash several months previously and no proper disinfection had taken place. Dr. Crane, learning of these cases for the first time, undertook to investigate further at once, and take such precautions as necessary. I called on Dr. Ling, M.H.O., Mr. McPherson, Chairman Board of Health, and Mr. McMillan, and advised with them *re* vaccination and disinfecting the schools.

9th. Township of Aldborough, County of Elgin. Near the Dunwich cases I also visited a family in Aldborough, to the south-west of Dutton, and there confirmed a previous diagnosis of smallpox, but the family was in quarantine and easily dealt with. Later in the day Dr. Dorland, of Rodney, M.H.O. for this township, drove me across several miles to Wardsville, on the way visiting Wm. Milner's family, where I found an interesting and typical case in a boy 15 years old and never vaccinated. The rash had been out five or six days, and there were about 300 pustules all over the body, about two dozen on the face and several on palms of hands and soles of feet. Dr. Rennie, of Wardsville, had charge of this case and had vaccinated the rest of the family, three children with father and mother a few days before, and at the present writing, I understand, they have so far escaped. This case I think can be traced to a letter received twelve days before the rash appeared from friends in Orion, Michigan, in whose family there had been smallpox shortly before. The letter was received, opened and freely handled by the patient. All necessary steps were being taken by Dr. Dorland, M.H.O., and Dr. Rennie to prevent spread of the disease from this patient.

10th. Village of Wardsville, County of Middlesex. Dr. Rennie., M. H. O., reported several cases here. On evening of June 15th, I visited the village and found Dr. Gould, a recent graduate of the Western University of London, in charge of the cases, which were all quarantined and being properly looked after. With Drs. Rennie and Gould I visited one family who had expressed doubts about the correctness of the diagnosis, and found a well marked case in an adult female. There had been typical prodromal symptoms and a fairly free rash out on face, arms, etc., for seven days. I left them apparently satisfied to be quarantined. Dr. Rennie, M.H.O., and the local Board of Health deserve credit for the vigorous and prompt action taken to stamp out the disease. These cases are said to have been traced to one of the infected families in Dunwich, where they had been visiting. None of the cases here had ever been vaccinated.

On June 16th, I visited the Village of Newbury where rumor said there had been cases called "Cuban Itch." Dr. Robertson, M.H.O., said there had been cases near the village in the spring called "Cuban Itch," but if "Smallpox" and "Cuban Itch" were the same thing, then they had been misnamed, as there certainly had not been anything of a smallpox nature seen by him or brought to his notice.

The same day at Glencoe I interviewed Dr. Walker, M.H.O. for the Township of Mosa, who I learned had been investigating some suspicious cases the day before, but he assured me there was nothing in the suspicions, and that the municipality was clear.

I have endeavoured to be of assistance where my services were desirable, and I have reason to believe my visits have been productive of great good in strengthening the hands of the local authorities in many instances.

New Legislation for the Protection of Water Supplies.

The following important amendment to the Public Health Act was placed upon the Statute Books of the Province by the Legislature at its last session. The growth of our urban municipalities with the increasing volume of raw sewage which is day by day and year by year being poured into the watercourses of our Province makes the legislation most imperative when viewed from the standpoint of public health and it is to be hoped the results which must follow the enforcement of this clause regarding public water supplies will be conducive of much benefit to the health of our towns and cities having public water supplies thus properly policed.

The clause which stands as subsection 6 of section 30 of the Public Health Act reads as follows:

(6) No sewage, drainage, domestic or factory refuse, excremental or other polluting matter of any kind whatsoever, which, either by itself or in connection with other matters corrupts or impairs or may corrupt or impair the quality of the water of any source of public water supply for domestic use in any city, town, incorporated village or other municipality, or which renders or may render such water injurious to health, shall be placed in or discharged into the waters, or placed or deposited upon the ice of any such source of water supply, near the place from which any municipality shall or may obtain its supply of water for domestic use, nor shall any such sewage, drainage, domestic or factory waste or refuse, excremental or other polluting matter be placed or suffer to remain upon the bank or shore of any such source of water supply near the place from which such municipality shall or may obtain its supply of water for domestic use as aforesaid, nor within such distance thereof as may be considered unsafe by the Provincial Board of Health, after an examination thereof by a member or officer of the said Board, and any person who shall offend against any provision of this section, shall upon summary conviction be liable to a penalty of not more than $100 for each offence, and each week's continuance after notice by the Provincial Board of Health or local Board of Health to abate or remove the same shall constitute a separate offence.

The first application under this amendment was from the authorities of the City of Peterborough, report upon which will be found in the next page.

The Peterborough Water Supply.

By CHAS. A. HODGETTS, M.D., Chief Health Officer of Ontario.

Application having been made by the Corporation of the City of Peterborough, under sub-section 6 of Section 30 of the Public Health Act, which empowers this Board to define the area within which it shall be illegal to contaminate the source of the corporation's water supply.

I beg to report, having made an examination of the waters of the Otonabee River above the intake on both banks thereof, as far as the Village of Lakefield, and would recommend this Board to define the area within which it shall be unlawful to either put polluted matter of any kind into the waters, or upon the ice of the river, or on the banks of the Otonabee River, within a point beginning on the shore at the pump-house, and bounded by the road which parallels the west and east shores, till the shores of the Lake Katchewanooka are reached, and any ditches or water courses which empty into the said river, provided, however, any sewage effluent or domestic waste treated in a manner satisfactory to this Board, shall be permitted to be run into the waters of the river.

I would also recommend that this Board notify settlers and owners of summer residences and hotels situate in or steamboats plying on the Kawartha Lakes, that the emptying of sewage and house or other waste, or the construction of privy pits in such a manner as to contaminate the waters of these Lakes, will be considered a nuisance by this Board, and where the practice exists must forthwith be discontinued.

Supplementary to Peterborough Report.

The following suggestions are made in reference to the water supply of this city.

(1) I am of the opinion the intake pipe should be run into deeper water further up the stream.

(2) A dry earth closet should be provided for the employees at the pump house.

(3) Mr. Carnegie, whose property adjoins that upon which the pump house is situated, having a water closet on the premises, should construct a septic tank close to the house, large enough to hold twenty-four hours' discharge, and provide for the distribution of the effluent by tiles distributed in the adjacent ground which is well suited for the purpose.

(4) The premises of Mr. Isaac Fredenburgh require considerable cleaning to be done. The stable and manure heap in their present position and condition, will cause pollution of the river, particularly after each rainfall, the pig-pen, although somewhat removed from the bank, yet from its filthy condition and the lay of the land, will also seriously pollute the river. Both of these should be removed to a further distance, as also should the closet, which should be converted into a dry earth closet.

(5) The closet at the house of Mr. E. L. Davis, near No. 5 Power House, is not only too near his own well, but is too near the bank, being in shale. This should be removed and a dry earth substituted therefor.

(6) The stable, closet, etc., situated in the building on the premises of Mr. Dewsbury, No. 5 Power House, abuts in the water, and should be removed from their present position.

(7) The drainage from the barns, stables, etc., of Mr. J. J. Bickell is towards the river through the pasture field, the premises must be kept cleaner.

(8) In the Village of Lakefield the following unsanitary conditions exist, all of which must pollute the water.

(*a*) The Cavendish Lumber Company Limited, 100 men use closets which are situated over the river, the closets should be removed back from the river and converted into dry earth closets.

(*b*) Similarly the closet of the Moore Planing Mill must be removed.

(*c*) The McAllister Milling Company.

(*d*) The J. Hull Flour Mill.

(*e*) The Griffin Saw Mill, each should discontinue the present closets and substitute dry earth closets.

(*f*) The raw sewage of the Craig House at present empties into the river just in the rear of the premises. It will be remembered a complaint lodged with the Secretary at the time, was followed by a notice to the authorities of Lakefield to stop the work, but this the local authorities ignored, the emptying of the raw sewage will pollute the river.

(*g*) At the office of the Cement Works notably a local nuisance exists, caused by the cesspool at the back of the Company's office, and the running of the contents into the ditch should be stopped.

The Water Supply of Cobalt.

By CHAS. A. HODGETTS, M.D., Chief Health Officer of Ontario.

Shortly after the inception of mining operations in the Township of Coleman and before any steps had been taken to organize the municipality, I instructed Dr. Bell, Medical Inspector of the Board, to visit the district and report on the sanitary conditions of the place. While in the district the Inspector gave specific instructions regarding the measures to be adopted for safe-guarding the springs which were at that time the chief source of water supply to the mining camps and at different times since the place has been visited by Dr. Bell, and notices were posted up warning the public against the use of water from sources which were found to be polluted, and to the measures adopted can safely be ascribed the fact that but few cases of enteric fever have occurred either in Cobalt or the Township of Coleman, a result most satisfactory considering the fact that the waters of Cobalt Lake, upon which the place is situated, showed pollution at an early date and has continued up to the present.

After a careful study of the ground by Dr. Amyot some months ago, he recommended Clear Lake as the source of supply in preference to Sassaganaga, analyses of the waters have been made and at the request of the Honourable the Minister of Lands and Mines I have inspected the Lake, and he has upon my recommendation consented to safeguard the waters of Clear Lake by inserting in any mining rights which may be granted on the shores of the Lake, a clause which will make clear the rights of these waters as a public water supply, a measure which will very naturally assist the municipality in preventing pollution.

I would, therefore, recommend that the Board approve of the application of the municipality of the Township of Coleman that the waters of Clear Lake be used as the source of supply for Cobalt and District, conditionally to the final plans being filed with the Board. The quality being good and the quantity such as to provide ample supply for a population many times greater than the present number.

I would, however, point out that it may be necessary for a limited period each year to provide for the treatment of the water of this lake, as speaking generally in the waters of this section of the Province there frequently occurs a vegetable growth which renders the waters unpalatable. This is a contingency which may not occur as regards the waters of Clear Lake. If such a contingency should arise then the waters must be purified to the satisfaction of the Board.

APPENDIX A.

Report on Waters received from Mr. Wright, of Cobalt, on May 16th, 1906.

By DR. J. A. AMYOT.

Laboratory Numbers.	Senders' Numbers.	Where collected from.	Streptococci.	Staphylococci.	Colon Bacilli.	Colonoid Bacilli.	Chlorine in parts per million.
1951	No. 1	100 ft. from shore, 20 ft. of water, south-east shore...............	—	—	—	—	4
1952	No. 2	50 ft. from shore, south-west shore	—	—	—	—	4
1953	No. 3	100 ft. from shore, south shore......	—	—	—	—	4
1954	No. 4	100 ft. from shore, north shore......	—	—	—	—	4

None of these waters show chemical pollution nor infection with harmful bacteria.

The Sewerage System and Water Supply of Picton.

By CHAS. A. HODGETTS, M.D., Chief Health Officer of Ontario.

Upon visiting this town and interviewing the mayor, town clerk and secretary of the Board of Water Commissioners, I found that at present the town has a water works system intended for fire protection only. This supply is obtained as stated by Mr. Chipman from the harbor—the fact that 190 services have been connected with the mains would indicate that some of this water must be used for domestic purposes, notwithstanding the statement of the town officials to the contrary.

With a view of securing for the town at the same time a potable water supply and sufficient for fire and other purposes, Mr. Chipman's services were engaged and that gentleman has considered the following sources:—

(*a*) Lake of the Mountain.
(*b*) Picton Bay.
(*c*) Picton Harbor.
(*d*) Springs about 1½ miles north of the town.
(*e*) Trout Brook.
(*f*) West Lake.
(*g*) East Lake.
(*h*) Cemetery Springs.

The opinion of the engineer upon the several sources need not be repeated here as they are fully set forth in his report. I fully concur in his remarks regarding the waters of Picton Bay and Harbor, and if a potable supply is to be obtained from either of these sources slow sand filtration would be necessary. The engineer also places the springs north of the town as not necessary of further consideration owing to insufficient flow.

The description of both West Lake and East Lake are in my opinion sufficient to preclude either of these as a probable source without the addition of a filtration plant.

As regards the Mountain Lake, the engineer considers the undertaking at present too expensive for the town.

We have, therefore, but two propositions to consider, viz., Trout Brook and the Cemetery Springs, the latter are all within the corporation limits and apart from the sentimental reasons advanced I am of the opinion it would be impossible to guarantee that the same would always be free from either chemical or bacterial infection. Of the eight proposed sources we find only that of Trout Brook remaining. These waters find their origin as described by Mr. Chipman, the watershed being cleared farm lands with a surface of sand and gravel and here and there well wooded bush lands.

In appearance the water is bright and crystalline, cool and potable, and the quantity I should judge to be as stated by the engineer. If this is used as the source of supply it would be advisable for the corporation to acquire sufficient land in the immediate neighborhood of the proposed galleries or wells so as to preclude for all time the possiblility of infection by reason of the encroachment of farms in the immediate neighborhood, a contingency which is likely to arise, and, if not provided against now, may in the future cause considerable trouble, disease and monetary expense.

Before finally deciding upon this brook as the source of water supply it may not be unwise for the town to consider the advisability of boring an artesian well to ascertain the possibilities of this as a source of supply.

The sewerage system is not considered by some as of so much importance to the town as the water supply. From what I saw of the town I consider the question only secondary to that of water, indeed with the present questionable supply the necessity for a sewer in at least one portion of the town has arisen I found an unauthorized sewer running parallel to the Main Street at the back of some of the retail houses into which sewage from a number of the places of business, hotels and private houses now discharges to find an exit at the eastern end of the town into the harbor. This unauthorized sewer, constructed by a number of private individuals, should never have been permitted by the municipal authorities, and it is a question if these persons using it could not be indicted under the Criminal Code, as causing a nuisance at the outlet of the sewer detrimental to the health of the public living in the immediate neighborhood - a remark which is equally applicable to the manner in which the two large canning companies have carried their factory effluent and sewage to a point in the marsh at the western extremity of the bay, where I am credibly informed a nuisance is created, particularly noticeable in the late Summer and early Fall months. Both of these sewers should be condemned on sanitary grounds and in this manner the necessity for a sewerage system with proper disposal of the effluent will become a live question, otherwise the whole matter will remain unsettled for years or until some epidemic such as that of enteric fever arouses the majority of the citizens to comprehend the needs of the town as regards this important question, for at present the situation may be described as one of public inertia—except on the part of a few progressive public men.

From the imformation obtained I do not think this Board should finally pass upon the plans for both a system of sanitary and storm sewers as submitted, sufficient to approve of the general plan of sewerage, including the construction of a septic or sedimentation tank of sufficient capacity as to always hold the average 24 hours' flow, but intimating that when called upon the town must install a system of secondary treatment to be approved of by this Board, and hence it would be as well for the engineer to consider this in locating the septic tank and outfall.

APPENDIX A.

Report of Picton Samples Received on June 13th, 1906.

By DR. J. A. AMYOT.

+ Present in 1cc quantities.
— Absent from 1cc quantities.

Laboratory Numbers	Senders' Numbers	Where collected from	Streptococci	Staphylococci	Colon Bacilli	Colonoid Bacilli	Chlorine in parts per million
3786	No. I	Spring near end of lane	—	—	—	—	5
3787	" II	Spring in creek near Corduroy bridge....	—	—	—	—	7
3788	" III	Large pool 40′ from creek, 2 large springs.	—	—	—	—	8
3789	" IV	Creek at lower pole bridge..............	—	—	—	—	5
3790	" V	Cemetery, spring near road.............	—	—	—	—	12
3791	" VI	Present intake Picton harbor............	—	—	—	—	8
3792	" VII	Picton harbor..........................	—	—	+	—	8
3793	" VIII	Middle of bay outside Hallowell Cove....	—	—	—	—	8

The cemetery spring shows rather high chlorine.
The harbor water is infected with intestinal bacteria.

APPENDIX B.

Report upon a Sewerage System for the Town of Picton.

By WILLIS CHIPMAN, C. E.

TORONTO, May 1, 1906.

To the Mayor and Council of the Town of Picton.

GENTLEMEN,—In May last I received your instructions to report upon a System of Sewers for the Town of Picton, and give an estimate of the cost of the same.

Delay.—Some explanation is doubtless due your Council for the apparent delay in submitting this report. Your sewerage problem is so intimately associated with that of securing a pure water supply that the two could not be separated, and as the necessary field work on the water works investigation was not completed until March 17th, and as I was absent in the North West and elsewhere the greater part of March and April, I have found it impossible to complete the report and estimate until now.

Field Work.—The levelling on the streets for the topographical plan was done during the months of November, February and March by my assistant, Mr. G. H. McVean, who also prepared the general plan under my directions, which is submitted herewith.

In addition to the levelling in Town the Harbor and Bay were surveyed and several lines of soundings taken from the ice.

Topography.—The Town of Picton is favorably situated for surface drainage, nearly all of the built up portions being on high ground. The Harbor and the Marsh, which is simply a production of the harbor to the westward, divided the Town into two parts, the more important on the north side.

The escarpment that follows the south shore of Picton Bay from beyond the Lake on the Mountain to Picton has an elevation of about 200 feet above Bay. On the north side the highest elevation in town is less than 100 feet above the bay. The escarpment is Trenton limestone, which also underlies the entire town, but with the exception of Rogers Street, Belleville Street, Main Street north of Bridge Street, and Bridge Street east of Head Street and cross streets in the vicinity very little rock will be struck in the excavations for sewers.

Disposal.—The proposed sedimentation tank will remove practically all of the suspended matter, and will effect a purification of about 50% in the sewage.

I believe the dilution of the sewage by the stream flowing through the marsh will be sufficient to prevent any local nuisance arising in the harbor.

At Barrie the crude sewage has been disposed of for a number of years by conveying it to a distance of 400 to 500 feet from the shore of Kempenfeldt Bay, which is very similar to Picton Bay. The currents, winds, waves and vegetable growths on the bed of the bay appear to oxidize the organic matter, and thus prevent a nuisance arising.

If your town should become a large city, it may then be necessary to extend the outlet farther lown the bay, and eventually it may be necessary to purify it to a greater degree, in which case pumping would probably be necessary, but until your town has doubled its population, I am of opinion that the sewage may be safely turned into the harbor, provided the water supply be taken from the lake on the mountain, Trout Creek, or any of the sources west of the town.

Main Sewers.—North of the marsh practically all of the domestic sewage can be conveyed to one point, and south of the marsh, the sewage may be conveyed to another point, as shown on the general plan of the town.

I propose to convey the sewage from the north side of the marsh to the south side by means of an inverted syphon, or by an iron pipe supported on trestles, the sewage of the entire town to be partially purified by passing through a sedimentation tank to be located north of Mill Street, and east of York Street, the effluent to be conveyed by a submerged pipe into the harbor.

I propose to construct a main sewer from William Street to Main Street at the County offices, also from William Street westerly to Ferguson Street near the entrance to Glenwood Cemetery, these sewers to be laid along the hillside at such an elevation as to serve as an outlet for all of the town to the northward.

On the south side a main sewer is to be constructed along Mill Street eastward and on Head Street from William Street to Bridge Street. The only portion of the town that cannot be served by this system is a portion of Bridge Street between Main Street and Head Street and Mary Street.

The premises of the Wright Canning Co. on the west side of William Street south of Mary Street, are at such a low elevation, that it will be necessary for them to pump their sewage up into the main sewer, but as they have a steam plant, this can be done at a slight expense.

Practically all of the sewage, by adopting my plan, will be diverted from the marsh.

Sanitary Sewers.—The sewers shown on the plan in red lines are for conveying the domestic or house sewage and manufacturing wastes. They will also serve as outlets for cellar drains and subsoil drains, but they are not to be used for street or surface drainage.

The extent of the sanitary sewer system included in my estimate, is as follows:—

12-inch pipe	6,000 feet
10-inch pipe	5,600 "
8-inch pipe	13,000 "
Total	24,600 feet of sanitary sewers.

The main sewers and the cast iron outlet pipe will increase the above by 6,400 feet, or a total of 31,000 lineal feet of sewers.

Storm Sewers.—In my opinion all of the street water can be taken care of by the existing watercourses and drains. There may be some streets where short storm sewers may be desirable, but these works should be included in the street improvements.

The watercourse and drain that runs easterly between King and Main can take care of the surface water from a large area, and as the domestic sewage is to be diverted from it, this stream will cease to be a nuisance.

A large storm drain has also been constructed on Bridge Street from the harbor to Main Street. Important storm drains have also been constructed on Ferguson, Bowery, Elizabeth, Centre and Paul Streets. Probably all of these sewers are now used to some extent for domestic sewage, and as you have no by-law to regulate plumbing, it is evident that the foul emanations from these roughly constructed drains must now find an entrance into the dwellings through the cellar drains and defective plumbing.

Cost.—I estimate that the proposed sewer system will cost as follows:—

Land and right of way	$2,000
Disposal works	6,000
Outlet to Bridge	2,000
Outlet extended into harbor	3,000
Main sewer on William and York	3,000
1,500 feet of 15-inch tile	3,000
2,400 feet of 12-inch tile	3,000
300 feet of 8-inch tile	400
Rock on Bridge and William	1,000
Engineering and contingencies 10%	2,000
Total	$25,400

This represents the total estimated cost of the disposal works, outlet into harbor, and the main sewers.

For the present, the extension of the harbor outlet may be omitted, reducing the total cost to $22,000.

All of this amount should be paid for out of the general funds of the municipality.

I have shown in full red lines on the plan, the lateral or street sewers that are included in the following estimate:—

6,000 feet of 12-inch tile in earth	$10,500
5,600 feet of 10-inch tile in earth	8,500
13,000 feet of 8-inch tile in earth	18,000
Total	$37,000

The cost of the rock work in addition to the foregoing will be approximately as follows:—

North end Main Street	$2,500	
Johnson Street	500	
Maple Street	500	
Mill Street	750	
Head Street	500	
Union Street	2,750	
Bridge Street	2,000	
Mary Street	500	
		$10,000
Engineering and Contingencies		4,600
Total cost of lateral sewers		$51,600

The town should, I think, pay for the rock, which added to the sum estimated as the cost of the main sewers, etc., would give $32,000 as the town's share of the cost, not an extravagant amount.

Probably some of the rock work may be omitted, and the town's share reduced to $30,000.

The balance of the cost may be raised by a frontage tax on the property benefited.

The assessable frontage on 25,000 lineal feet of sewers would be about 38,000 feet. This is approximate.

In Oshawa on 28,500 lineal feet of sewers, the assessable frontage was 47,000 feet, and in Midland on 14,000 feet of sewers, the frontage amounted to 20,900 feet.

By adopting a frontage tax of one dollar and ten cents per foot, the sum of $41,800 would be raised, which would cover the cost of the sanitary sewers exclusive of the rock, which I have recommended the town at large to pay for.

Payments.—To raise by general taxation a sum sufficient to sewer part of the town only, would be an injustice to those portions of the town not sewered.

To sewer the town piece-meal on the frontage plan, as provided by statute, would give you a disconnected, imperfect, unsanitary system of sewers.

I propose neither of these methods, but the uniform frontage rate system, the same as that adopted by Brantford, Barrie, Toronto Junction, Berlin, Niagara Falls, Smiths Falls, Sault Ste. Marie, Midland, Oshawa, Guelph, and other places. By this method the town council by by-law fixes the rate to be assessed upon abutting property,—this tax to be levied only where a sewer has been constructed. This frontage rate has, as a general rule ,been sufficient to meet about half the total cost of the sewerage system, when such system is practically completed. The other portion of the cost is to be paid by the town, the interest and sinking fund being met by a general sewerage tax.

The lower the frontage rate adopted, the higher the general tax, and the higher the frontage, the less the town's share.

For corner lots the town may, by by-law, prescribe some equitable exemption. This is generally fixed at about 100 feet for each corner, or half the total frontage, the exemption not to exceed 100 feet.

In case of a corner lot 33 feet by 131 feet, the assessed frontage would be 33 feet only, if a sewer were built on the front street and none on the side street. If a sewer were afterward built on the side street, an additional 49 feet would be assessed, making 82 feet in all. If however, the sewer were first laid on the side street, the assessment would be 82 feet, and no further assessment would be made.

If a building be erected at the rear of the lot, each building should be treated as a separate lot.

For the Town of Picton I would recommend a uniform frontage rate of not less than one dollar, nor more than one dollar and one-quarter per foot, which will give an annual tax of about six cents to seven and one-half cents per foot frontage, this sum to be collected only on streets where sewers are laid.

By the Local Improvement Act there are three methods of procedure specified for building a sewer:—

(1) By petition.

(2) By taking the initiative.

(3) As a sanitary measure

In the majority of places the town proceeds on the initiative, until the principal sewers are constructed, and this is the method I would recommend you to adopt.

Recommendations.—I would recommend you to raise a sufficient sum by general by-law, to meet the cost of the main sewers, sewer outlet, and disposal works, the balance to be paid by the frontagers, that is, the frontage tax will meet the cost of the sewers in the town. Something should also be added for the town's share to pay for the rock excavations.

I would further advise you to proceed on the initiative in the construction of street sewers, as this is the only business way of sewering the town properly. You cannot leave such an important matter until the works are petitioned for.

On streets where rock will be met with, some saving would be effected by laying the sewers and water mains in the same trenches.

At Guelph where there is some rock, the frontage tax was fixed at $1.25, at Oshawa $0.85, and at Midland $1.00.

APPENDIX C.

Report upon Improvements to the Water Works System of the Town of Picton.

By WILLIS CHIPMAN, C. E.

Toronto, May 1st, 1906.

To the Chairman and Members
Of the Board of Commissioners for E. L. and W. W.,
Picton, Ont.

Gentlemen,—In May, 1905, I was engaged by your Board to report upon improvements to the existing water works system, and about the same time I was also engaged by the town council to report upon a system of sewerage.

Surveys.—I made my first preliminary visit to Picton on August 18th, 1905, and in the latter part of October my assistant, Mr. J. A. Craig, commenced the surveys and levels, which were continued by Mr. H. G. McVean in November.

As a result of the levels taken in 1905, I decided to extend the surveys to points some distance from the town, and on February 2nd, 1906, Mr. McVean returned to Picton and continued at work until March 17th, 1906. In all fifty-three days were spent by my assistants in Picton. Levels were taken to East Lake and to West Lake, as well as over the streets of the town, a survey made of the harbor, soundings taken and data secured for this report.

I made a second personal visit to Picton on February 14th, 15th, 16th and 17th, and a third on March 8th, 9th and 10th.

I now beg to submit for your consideration two plans, each dated May 1st, 1906. The first or general plan shows the environs of the Town of Picton on a scale of 50 chains to the inch. The second plan is a blue print of the proposed sewerage system on a scale of 165 feet to the inch.

Existing Works.—The existing water works system was constructed in the years 1888 and 1889 and the electric light system in 1892 as municipal enterprises, and were operated by the town council until 1900, when they were placed under the management of a Board of Commissioners. No important extensions have been made to the water works system since it was constructed, but the lighting system has been greatly enlarged and improved and was practically reconstructed in 1899 and 1900 at a cost of sixteen thousand dollars ($16,000). Important extensions are now being made to the electric lighting plant at an expenditure of ten thousand dollars ($10,000).

The water supply is now taken directly from the harbor at the wharf adjoining the power house and pumped by a compound duplex steam pump placed in the boiler room of the power house to a reservoir on the hill overlooking the cemetery south-west of the town. This pump has a capacity of 300 gallons per minute only. Four return tubular boilers with a combined capacity of 300 h.p. (nominal) supply steam for the two electric lighting engines and the steam pump.

When the reservoir is overflowing it gives a pressure of 90 pounds on the pump house gauge (which has an elevation of 11 feet above the bay), when the pumps are idle. The reservoir contains about 250,000 imperial gallons, and the elevation is sufficient to give a fair fire service in the business section of the town, the pressure at the hydrants on Main Street averaging 70 pounds. Direct pressure may also be given by the pump, but it is of too small capacity to be of much service.

An 8 inch main extends from the pumps to the reservoir, all the other mains being 6 inch and 4 inch.

The existing system comprises:—

6,900 feet of 8 inch main,
6,500 " 6 " "
9,000 " 4 " "
2,600 " 2 " pipe, a total of 25,000 lineal feet, or nearly five miles, with 40 fire hydrants and 22 gate valves.

Present Supply.—Your water works system was constructed for fire protection only, but about 190 services have been connected with the mains, the water being used for a variety of purposes. There can be no doubt that it is used to a certain extend for domestic purposes, although the water must be contaminated, as the harbor receives the surface water from the entire town and the country immediately surrounding it.

There are now three large canneries in the town which discharge their refuse water into the marsh, all of which water eventually finds its way into the head of the harbor.

The second most important water course through the town is the small stream flowing parallel with Main Street between Main Street and King Street, which discharges over the cliff in the vicinity of the registry office. This stream has, in many parts of its course, been converted into a storm drain by building side walls of masonry and covering the top, and in some places tiles have been laid. This water course now serves as a sewer, receiving storm water, domestic sewage, and the discharge from cellar drains. A visit to the outlet will convince any one that a large volume of sewage is discharged into it. There are also several other small water courses that drain to the harbor, including those from the cemeteries.

Proposed Sources.—The town now has a population of over 4,000 people, and should be supplied with a pure water for all domestic purposes.

I investigated the following proposed sources of supply:—

(*A*) Lake on the mountain at Glenora.
(*B*) Picton Bay.
(*C*) Picton Harbor.
(*D*) Springs about 1¼ miles north of Picton.
(*E*) Trout Brook.
(*H*) West Lake.
(*K*) East Lake.
(*J*) Cemetery Springs.

Lake on the Mountain.—The lake on the mountain has an elevation of about 180 feet above the bay, and is therefore nearly 40 feet lower than the water in the town reservoir. It has been proposed to connect this lake with the town water system.

The water from the lake on the mountain is undoubtedly suitable for domestic purposes, although analyses have not been made, but in my opinion it would now be too expensive an undertaking.

The length of main necessary to connect the main with the town system would be about five miles, of which part of one mile would be in rock cutting.

The quantity of water that the lake would supply has not as yet been determined, but I am of opinion that the value of the water to the owners of the water power at Glenora would now be greater than its value to the town as its water supply. The most satisfactory proposition that could be considered by the Board would be to purchase from the owners of the lake a definite quantity of water per day, measured by meter. It should also be noted that to force the water from the lake on the mountain to the reservoir would require a small pumping plant, but for domestic purposes the lake on the mountain would give a sufficient pressure, the reservoir supply being retained for fires.

The quantity of water now pumped per day varies greatly. Last July the amount varied from 100,000 gallons per day to 270,000 gallons. It is probable that the average would be about 200,000 gallons.

Picton Bay.—If the supply were taken from Picton Bay at a point about half way between the lake on the mountain and the harbor, I believe it would prove quite satisfactory during the greater portion of the year, and there would be little danger of sewage contamination; but I am informed that the water in the entire bay becomes tainted in the late summer and early autumn months, this being due to the decay of vegetable growths, which imparts a fishy taste to the water.

If this source of supply were to be seriously considered analyses and bacteriological examinations should be made during the coming summer and autumn.

Picton Harbor.—The water in the harbor is now so seriously contaminated that I cannot recommend you to adopt it as a source of supply, even if filtered, and as it must eventually receive the effluent from the sewage disposal works, it will probably become more contaminated in the future than at the present time. The use of the harbor water for domestic purposes should be prohibited.

Springs.—The springs north of the town were examined, but the flow is not sufficient for a water works system.

Trout Creek.—Trout Creek is the name given to a small spring brook that flows westerly from the westerly limit of the town to West Lake between the C. O. R'y. and the Ridge Road. The water shed may be assumed to be bounded on the north by the Bloomfield Road, and on the south by the Ridge Road. The easterly part of the water shed is principally cleared farm lands, the surface soil being sand and gravel. I walked over the upper portion of this water course and was surprised to find that it received practically no surface drainage, all of the precipitation being absorbed by the soil.

At the time of my inspection on March 9th, the easterly or upper part of the stream was fed entirely from large springs along its course. The stream was gauged at the lane between Lots 18 and 19 and found to be between 800,000 and 900,000 gallons per day.

I am of opinion that by excavating wells and galleries eastward from this lane that a supply of at least 1,000,000 gallons per day may be obtained for the use of the town, and I am confident that bacteriological examinations will show that this water is free from contamination. At this point the elevation of the water is 25 feet above the level of the water in Picton Harbor.

I believe that this stream will give an ample supply of pure water for all purposes, and I have no hestitation in recommending it as your proposed source of supply.

Lakes.—West Lake and East Lake have been suggested as possible sources of supply. Both of these lakes are marshy at the easterly ends, which are the nearest to Picton, and I am of opinion that the water in these lakes will have a weedy or fishy taste during certain seasons of the year, but this can only be determined by analyses and examinations continued during the summer and autumn months.

If either of these lakes were adopted as a source of supply, a pumping station would be necessary. The length of the force main from East Lake would be about five miles, and from West Lake over six miles.

Cemetery Springs.—The springs in the vicinity of the cemetery, if collected, might give an adequate supply, but there would always be a sentimental objection to the water from these springs, even if a chemical analyses should demonstrate the water to be perfectly pure. I doubt very much, however, if the supply would be found sufficient in a dry season.

The springs on the north side of the cemetery break out at the surface of the rock, the depth of earth over the stream being but a few feet. It is quite probable that these streams would be found polluted. I am of opinion that these springs and streams should be retained for ornamental purposes, for which they are well suited. If they were taken away for a town supply, it would be necessary to introduce water to the cemetery from the town water works system.

Pumping Station.—A new pumping station should in my opinion be erected in the vicinity of Lots 19 and 20, a short distance north of Trout Brook.

The pumping machinery should comprise two steam boilers and one compound duplex pumping engine of a large capacity for fire service. There should also be installed either one small steam pump for domestic service, or an electrically operated pump, whichever may prove upon investigation to be the cheaper to operate and maintain.

By constructing a short siding, coal may be delivered at the pump house via C. O. R. by the carload.

Force Main.—The force main from the pump house to connect with the existing pipe system may be laid diagonally across the farm lands, or by the lane above mentioned and the Bloomfield Road. Although the former route will be slightly longer, I am inclined to believe it will be the cheaper, as you will have a free right of way by this route. This force main should be 12 inches in diameter from the pump house to Henry Street, thence a 10 inch main along Main Street from Henry Street to East Lake Road, thence along East Lake Road to Mary, thence along Mary to Ferguson.

This main may be connected with the existing 6 inch pipe on Main Street at Henry, and the 4 inch pipe on Mary Street should be taken up and relaid elsewhere. This rearrangement of the piping I think would be preferable to taking up the 6 inch main on Main Street from Henry Street to Chapel Street.

Distribution Pipes.—I have shown on the plan in full blue lines the existing water mains, the proposed extensions being shown in broken blue lines.

The proportion of 4 inch pipe laid is altogether too great, and there are not a sufficient number of gate valves.

You cannot give an efficient fire service from a hydrant off a 4 inch main of a greater length than 600 feet, owing to the friction in the small pipe.

The business portion of the town is provided with an 8 inch pipe, but this should have been extended across the harbor to the court house, to the canneries at the west end, and to the high school.

I propse the following extensions to the mains, exclusive of the force main from the pump house:—

5,000 feet of 6 inch pipe.
12,000 feet of 4 inch pipe.
300 feet of 2 inch pipe.

Total.................................. 17,300 feet of pipe, and 24 fire hydrants.

The foregoing does not include the replacing of the 6 inch main across the bridge with an 8 inch, nor the extension to the high school.

You may decide to lay a new 8 inch down William Street and along York and Mill to the vicinity of the court house.

An 8 inch main might be laid from Main Street north-westward on Washburn to King, thence along King and Queen to Elizabeth, or the Elizabeth Street pipe might be taken up and replaced by an 8 inch.

Cost.—I estimate that the cost of the proposed works will be as follows:—

Land and right of way		$3,000
Collecting gallery and wells		5,000
Pump house		6,000
Pumping machinery		6,000
Force main, 9,000 ft. 12 in. pipe	$18,000	
3,100 ft. 10 in. pipe	4,500	
		22,500
Engineering and contingencies		4,500
Total		$47,000

This represents the cost of introducing a new supply from Trout Creek.

If you desire to extend the pipe system as shown on the general plan, the additional cost will be as follows:—

5,000 feet of 6 inch main in earth	$5,000
12,000 feet of 4 inch main in earth	10,000
200 feet of 2 inch main in earth	100
Hydrants and valves	1,500
Rock at north end of Main Street	1,000
Rock on Bridge Street	1,800
Rock on Mary Street	400
Rock on other streets	400
Engineering and contingencies	2,300
	$22,500

I have estimated that the rock trenching will cost one dollar per lineal foot over and above the cost of trenching in earth.

If it be decided to lay an 8 inch main to the vicinity of the court house, this will increase the cost by about 2,500, and a new main to the high school on Elizabeth will cost about 2,000.

If all of the above described works be proceeded with the total cost would be $74,000.

I am of opinion, however, that some saving would be effected by laying the water mains and sewers in the same trenches, where rock will be met with, and if the larger mains be laid to the high school and the court house, the pipes taken up could be relaid elsewhere. I am therefore of opinion that with the sum of $70,000, you would be able to supply the citizens of Picton with a pure water supply, and extend the mains to all portions of the town where a reasonable revenue might be expected.

I am informed that the works as originally constructed, cost about $24,000, and about $6,000 was expended between 1890 and 1900. This will give the total cost of your water works system as $100,000, which is not an unreasonable amount, taking into consideration your population and the assessed valuation.

Your electric lighting system will have cost about $35,000 when the present improvements and extensions are completed—a comparatively cheap system.

The Water Supply, Sewerage System and Sewage Disposal of New Liskeard.

By CHAS. A. HODGETTS, M.D., Chief Health Officer of Ontario.

Water Supply.—The Report of Mr. Willis Chipman, C.E., upon this question of water supply refers to the following as possible sources of supply, viz., Wabbi Bay, Wabbi River and springs in the Township of Harris. The engineer's objections to the use of the water of Wabbi bay without "thorough filtration" such as could only be secured by the construction of slow sand filter plant are well taken.

The other sources may be grouped as follows:—(*a*) The waters of the Wabbi in the Township of Bucke. Apart from the engineering differences as regards gravity were the waters taken at Watson's Falls, and the pumping required if the waters were used at a point lower down the river some two miles nearer the town, I am of the opinon the water could never be considered as one that could be recommended for domestic use without treatment for the following reasons:—(*a*) laboratory examination shows bacteria infection; (*b*) their potableness is impaired; (*c*) the color is such as would make the public object to its use.

I found that the prospectors in the immediate neighborhood did not use the waters of the river, but in every instance preferred obtaining spring water even when it entailed both time and labor.

Under group "B" I include the waters of the two springs in the Township of Harris distant about 4,000 feet from each other, and whose united flow is estimated by the engineer to be one million three hundred thousand gallons per day, which considering the estimated daily consumption to be 200,000 gallons for the present population would indicate there is ample supply for a much larger population than that estimated at present.

The water of these springs is apparently of good quality, being bright, clear and cool and free from bacterial infection as shown by the laboratory report. It would, however, be necessary for the municipality to secure the land in the immediate neighborhood of the springs and gathering ground in order to prevent pollution of the waters, and at the same time the two farm houses with outbuildings adjacent to the springs must be removed and the property properly fenced to prevent cattle pasturing therein.

With these provisions attached I would recommend the Board grant its approval of the springs as the source of water supply.

Sewerage System.—The suggestion of the engineer that the separate system be adopted should meet with the approval of the Board if adequate provision is made for the treatment of the sewage.

Sewage Disposal.—The report and plans of the engineer provide for the discharge of raw sewage into the Wabbi River at two different points, viz.: May Street on the south side, and Katharine Street on the north side. I cannot, however, agree with the report that for the present raw sewage should be permitted to be discharged into the river, leaving the question of treatment permitting of even partial purification to the future. Condemnation of this proposal is found in the following extract of the report.—

"During high water in the lake the velocity of the river may not be sufficient to remove all deposits, but the flow in the spring and autumn would thoroughly clear the river."

particularly in view of the conditions of the shore of the lake on the south side of the mouth of the Wabbi, where in some places there is drowned land, conditions favoring the accumulation of portions of the sewage effluent which would tend to create a nuisance at this point.

I would further point out that this Board has has sufficient examples before when the recommendations made by the engineer in this case have been permitted with results far from satisfactory. It would not be an expensive addition to the system to require the construction of two septic tanks of sufficient capacity to hold twenty-four hours' discharge and capable of enlargement with the extension of the system. If this is done the debris will be removed from the sewage and by biologic processes a partial purification with liqufication will be obtained; thus will be discharged into the river and lake an effluent which will readily become diluted and at the minimum expense to the municipality the most satisfactory system will be obtained by the town.

APPENDIX A.

Report upon Water Works and Sewerage for the Town of New Liskeard.

By WILLIS CHIPMAN, C. E.

To the Mayor and Council TORONTO, May 5th, 1906.
Of the Town of New Liskeard.

GENTLEMEN,—On April 18th and 19th I made a personal visit to New Liskeard at the request of Messrs. Blair, Sinclair and Smith, your town engineers, to consult with them respecting water works and sewerage, and to obtain data for this report.

In March, my assistant, Mr. A. R. Campbell, took certain levels over the town, from which, and from additional levels furnished by your town engineers, he prepared a topographical plan, which is presented herewith, the proposed systems of water works and sewerage being shown thereon.

Topography.—The Town of New Liskeard is situated on Wabbi Bay, the most northwesterly extension of Lake Temiskaming.

The greater part of the town site is on high ground, affording good opportunity for drainage, but there is a large southeastern area extending back from the lake shore that is low and partially flooded during high water. The lake has a range of about fifteen feet between high water and low water, the highest water generally occurring in June, and the lowest in February or March. As a result of this extreme fluctuation, streets have been laid out and fenced to points approaching the low water line, and many buildings have been erected on land unfit for human habitation.

In my opinion there should be some governmental regulations respecting the selection and laying out of town sites.

The problems of water supply, drainage and sewage disposal are now too often given but scant consideration, and in nearly every town, streets have been laid out, and lots sold for residential purposes in tracts that should have ben reserved for railways, factories or parks.

The entire town is built upon a deep clay soil, not one rock exposure occurring within the town limits. From the level area along the lake shore, the surface of the ground ascends rapidy, the railway being about sixty feet above low water in the lake.

Southwest from the railway station the ground rises sharply, an elevation of two hundred feet above the lake being attained in about 500 yards.

The only permanent watercourse in town is the Wabbi River, which flows through a straight, deep V-shaped valley cut in the clay. This stream has an average width of about 100 feet in the town, the depth being such that vessels drawing six feet may navigate from the lake to the highway bridge. The bar at the mouth of the river has been cut through by dredging.

Every trifling rivulet that discharges into the river forms a deep cross ravine or gully producing a rough broken river bank.

The larger part of the town lies on the south side of the river, one highway bridge of timber uniting the two sections.

Wabbi Bay is extremely shallow, a large area being dry beach during low water.

Population.—The town now has a population of about 2,000, and is rapidly increasing, owing to the marvellous development of the natural resources of this part of the Province.

The town is located on the line of the T. & N. O. Railway, distant 113 miles north of North Bay, and about 100 miles south of Abitibi. It is also at the southeast end of the lesser clay belt with rich mineral lands to the south, and possibly to the north and to the west.

The assessed valuation was given me as only $400,000, a very low amount in my opinion, not equal to the land values alone.

An electric lighting and power system is now being installed by a private company. For the present, steam power will be used, but eventually power will be transmitted from Windigo Lake on the east branch of the Blanche River.

Sources.—The following proposed sources of supply have been considered:—

(1) Wabbi Bay.

(2) Wabbi River at Watson's Falls, at the north end of Lot 3, Con. IV, of the Township of Bucke.

(3) Wabbi River at the north end of Lot 4, Con. VI, Township of Bucke.

(4) Springs on Lot 1, Con. II, Township of Harris.

(5) Springs on Lot 2, Con. I, Township of Harris.

The water in Wabbi Bay, owing to the low character of the north and west shores, its shallow depth, and to the fact that the refuse of the town and the surrounding country is now washed into it by the Wabbi River, would be unfit for domestic uses without thorough filtration. It might be possible to secure a reasonably pure supply by laying an exceptionally long intake pipe, but this would be expensive and probably unsatisfactory, if not unsafe.

Gravity Supply.—Watson's Falls on the south branch of the Wabbi River are distant about 23,000 feet, or four and one-quarter miles from the railway station, by the shortest feasible pipe line.

The water above the falls has an elevation of 227 feet above the station, or 287 feet above low water in the lake, which head would give a static pressure at the hydrants on Armstrong Street of about 100 pounds, but unless the conduit pipe from the Falls to the town were of large capacity, the pressure would be materially reduced by the friction in the pipe. If for instance, a ten-inch main were laid, and two fire streams only were drawn from the hydrants, the pressure would be reduced from 100 pounds to 70 pounds, and if the domestic supply were 250 gallons per minute, only one fire stream could be obtained. With a twelve-inch pipe the results would be more satisfactory.

By constructing a reservoir near town, to be kept full by a small main laid from the Falls, and by laying a larger main from the reservoir to town, the fire service would be improved, but unfortunately there is no hill of sufficient height within the town to give this fire pressure by gravity, and the cost of the reservoir would probably offset the saving on a smaller pipe for part of the distance.

From the Wabbi River on the north end of Lot 4 in the VI Concession of the Township of Bucke, the distance to the railway station is less than two miles, but the elevation of the stream is 142 feet less than at Watson's Falls.

A ridge of land 160 feet in height intervenes midway between the railway and the river on this line, so that a pumping system would be necessary at or near the proposed source. This system would be more expensive than the Watson's Falls scheme, and has no advantages.

Springs.—The springs on Lot 1 in the 2nd Concession of the Township of Harris, take their rise within an area of about five acres of bush land. The discharge in August, 1905, being determined as about 400,000 gallons per day by Mr. Sinclair, the elevation above low water in the lake being about 20 feet.

The springs on Lot 2 in the 1st Concession take their rise in a more restricted area, and the discharge was found to be more than double that from the first spring, or 900,000 gallons per day, the elevation being about 30 feet above low water.

From the first mentioned springs, the distance to the eastern part of the town by way of the shore line is about 10,000 feet, the larger spring being 4,000 feet further on.

Without a detailed survey, it is impossible to estimate accurately, the cost of the conduit pipe from the springs.

Quantity.—The maximum quantity of water required per day for the Town of New Liskeard, with all the inhabitants using the water, should not exceed 200,000 gallons. Assuming the population to be doubled, the consumption should not exceed 400,000 gallons, that is, the flow from the smaller of the two springs would supply a much larger town than New Liskeard.

The two springs together should supply a population of 13,000 people.

The fire supply should be sufficient to give three standard fire streams in addition to the domestic supply, or a total of about 1,000 imperial gallons per minute.

Quality.—On March 31st samples of water were taken from the Wabbi River at Watson's Falls, from Lake Temiskaming and from Spring No. 1 in Harris, which were forwarded to the Provincial Board of Health for examination.

The Wabbi River at Watson's Falls was found to be not above suspicion. This is certainly surprising, and should be confirmed before being accepted as correct. The river above that point flows through an uninhabited district of forest and rocks, and as the volume of the stream is approximately 2,000 cubic feet per minute, serious pollution would appear to be impossible.

The water from the lake was condemned, owing to its surroundings, unless purified by slow sand filtration; an expensive process.

The water from the springs was alone found to be pure.

Distribution System.—On the plan which accompanies this report, I have shown in full blue lines the water works mains included in the estimate of cost, the total length being 17,000 lineal feet, with 40 fire hydrants.

I have shown the Armstrong Street main as crossing the Wabbi River above the existing highway bridge. If this structure be replaced by a permanent iron bridge, the water pipe might be carried by the bridge, being protected from freezing by frost proofing.

Reservoir.—With a gravity supply from Watson's Falls no reservoir would be necessary other than the river itself above the falls, if the water main to the town were of sufficient capacity. In my opinion, this main should not be less than twelve inches in diameter, in which case the loss by friction would be thirty pounds in town. If the gravity main were fourteen inches, the loss would be fifteen pounds only.

Taking into consideration the profile, the cost and the effect of the climate, I can see no advantage in adding a reservoir to the gravity system.

If a pumping system be adopted, a reservoir constructed at such an elevation as would give a fair domestic pressure in town, would be desirable, as this would permit the machinery to be closed down during part of the day.

I have shown a water tower or stand pipe on the plan, with base at an elevation of 130 feet above the railway, which will give a pressure of 80 pounds at the hydrants on Armstrong Street. A water tower 20 feet in diameter and 60 feet in height will contain about 120,000 gallons.

Cost.—I estimate that the proposed works will cost as follows:—

(*a*) Gravity system:

Dam and head gate	$2.000
Land and right of way	1.000
Conduits to town	50.000
Mains in town	19.000
Engineering and contingencies	8,000
	$80.000

Something should be added for riparian rights, but this could not be a very large sum owing to the small amount of water that would be taken by the town.

(*b*) Pumping system:

Developing and protecting springs	$2.000
Land and right of way	1.500
Conduit to pump house	15.000
Pump house and machinery	12.000
Mains in town	19.000
Water tower	8,000
Engineering and contingencies	5,500
	$63.000

The operating expenses of the pumping system will, however, exceed those of the gravity system by $1,500 per annum for the first two or three years, and this excess will increase year by year thereafter until at the end of ten years it may amount to $3,000 per annum.

It is evident, therefore, that the gravity system will ultimately prove the cheaper to adopt, although the first cost is $17,000 greater, representing $1,100 per annum interest and sinking fund.

In the foregoing estimates I have assumed that no rock will be met with in the excavations.

By substituting wooden pipes for cast iron in the conduit line the cost of the gravity system may be materially reduced, but if the wooden pipes be adopted the council must assume the responsibility of their durability. Glazed tile may also be used for short distances near the Falls.

Revenue.—I am of the opinion that within five years the works will be self sustaining, and that the revenue will equal the operating expenses from the first. About $2,000 per annum should be allowed for the fire protection given by forty hydrants, and for water used for municipal purposes. This will nearly meet the interest charges. Within five years you should have two hundred consumers, averaging $15.00 each, or $3,000 per year. The operating expenses should not exceed $2,000 per year, for some years.

Sewerage.—In all cities and towns water works and sewerage should as a general rule be constructed at the same time, for reasons not necessary to recite, but in your town, with its retentive clay soil, it would be a mistake to construct water works and omit sewers to remove the fouled water supply.

There are two different systems of sewerage known to engineers, the separate and the combined. In the former the rain water and street water are carried in one set of sewers called storm sewers, and the sewage proper carried into separate and comparatively small pipes called sanitary sewers.

The first separate systems to be constructed in this Province were constructed according to my designs some fifteen years ago, since which time similar works have been constructed under my supervision in Brantford, Barrie, Toronto Junction, Renfrew, Sault Ste. Marie, Smith's Falls, Gananoque, Midland, Port Arthur, Sturgeon Falls, Oshawa, and several other places.

The separate system is the only scientific and the only sanitary system for a small city or town.

Disposal.—To discharge the sewage of the town directly on the beach might prove objectionable, and long outlets would be expensive to lay and difficult to maintain in proper working order. There are also other objections.

I am informed that the Wabbi has a dry weather flow of over 3,000 cubic feet per minute. During high water in the lake the velocity of the river may not be sufficient to remove all deposits, but the flow in the spring and autumn would thoroughly clear the river.

I would, however, prefer to discharge the sewage into the river, and trust to the volume and current, rather than attempt to carry it to the lake.

When the town becomes a city it may be desirable to convey the sewage to the lake, and it may also be necessary to purify it to a certain degree; if so the system now recommended will require no modification.

Sanitary Sewers.—The surface grades of the street are such that there is no difficulty in obtaining a good fall for the sewers, but there is a comparatively large area of the town that is less than five feet above high water. This area cannot be sewered without a pumping plant, and I have included no part of it in the proposed system.

The main sewer on the south side will commence at the river bank on May Street, thence along May, Sharpe and Armstrong to Whitewood; thence up Whitewood as far as may be desired, with a branch on Wellington southerly about 200 feet; thence west across private property to Paget; thence southwesterly along Lake Shore Road as far as necessary.

Very few buildings lying south or east of the last described sewer can be drained into the system, being too low. Practically all of the town except this low area can be drained into the above described sewers.

On the north side I propose to commence on the north end of Katharine Street, thence along Murray Street with branches on the streets running north and south.

I have shown in full red lines on the plan the sewers that should now be built, about 11,000 lineal feet, which will cost about $20,000, if properly constructed according to modern designs.

Storm Water.—The removal of storm water is an important matter in your climate, but it would be an expensive undertaking to attempt to convey all the rainfall or the melting snow to proper outlets through large underground sewers. If made too small the sewers would be gorged and flooding of cellars would occur.

I would advise you to rigidly exclude all storm water from the proposed sanitary sewer system, but to carry it where practicable in gutters and surface ditches to the nearest outlet, and only construct storm sewers when you improve your streets.

I have shown a storm sewer on Whitewood Avenue, with a branch on Armstrong. If this be constructed it will probably serve present requirements, but as the streets become more closely built up and the roadways graded and macadamized additional storm sewers will be necessary.

Cost.—I would advise you to raise by by-law a sufficient sum to construct the sanitary outlets and storm sewers that you now intend to construct, and that the cost of all the other sewers be met by frontage tax.

The two outlets would cost about $1,000, the storm sewer from $2.00 to $1.50 per lineal foot, and the catch basins $30.00 each.

The sanitary sewers will vary in cost from $1.25 to $2.25 per lineal foot, the average being about $1.75 per foot. This includes manholes, engineering, superintendence and all expenses, but as stated above the entire cost should be met by a tax on the properties benefited.

Water mains should not as a rule be laid on streets where sewers are not petitioned for.

The excavating will be comparatively easy, and uniform as to depth and expense. This is another strong reason for adopting a frontage tax. The council may by by-law adopt some equitable method of assessing corner lots, and may also pay for the cost of street intersections and exempt properties, but this is optional.

I have given you sufficient data to form an estimate, but I would not advise less than $2,000 nor more than $10,000 as the town's share of the cost of the sewerage system.

There is no municipal undertaking that demands more care and experience in designing than sewerage. There are so many problems involved: Cellar drainage, soil pipes, plumbing, disposal of roof water, grades, depths, pipelaying, flushing apparatus, assessment of cost, etc., any one of which may appear simple of solution to the uninitiated, but they are of such importance that a large part of my personal time is taken up with this class of engineering work.

Report on the Proposed Sewerage System of Bracebridge.

By CHAS. A. HODGETTS, M.D., Chief Health Officer of Ontario.

It will be observed the engineer's plans are dated Dec. 31st, 1900, and they provide for the sewaging of the town upon the separate system, as also the partial treatment of the bulk of the effluent by septic tanks placed at the end of "Perry Street" adjacent to the power house, and it is provided that the remainder of the raw sewage be discharged into the Muskoka River at points below on each bank thereof.

After a visit to the town and an interview with the chairman of the Board of Health and the M. H. O., I find that a sewer was constructed in 1904, without the plans having been considered by this Board, on the following streets: Dominion, 12 in. sewer; Manitoba, 15 in., and Thomas Sts. 18 in., the outlet being into the river at the foot of the latter street; and further that some of the residents on McMurray and Quebec Streets have constructed a sewer along the sand, the effluent being discharged at the top of the hill close to Victoria Street, the sewage finding its way down the ditch which up to a short time ago was covered over by a broad foot path at that point and eventually being lost in the ground in the immediate neighborhood. In this latter case a nuisance has been created which is a disgrace to the town and one which possibly lays those who use the sewer open to prosecution under the Criminal Code of Canada. And again, another sewer constructed by private citizens which empties into a gully has been of such a nuisance to the neighborhood it has been designated "Diphtheria Hollow," the prevalence of this disease in the immediate neighborhood being ascribed to the unsanitary conditions of the place.

The desire on the part of often well-to-do citizens carrying away from their own premises that which if allowed to remain would not only offend their olfactory nerves but create a serious nuisance if conveyed beyond their sight and smell and discharged, they care not how or where, to become a nuisance either to the general public or other of their fellow citizens not so blessed or censed with a plethora of this world's goods.

Again I was informed that the majority of the residents on John Street convey their domestic waste and sewage to the back portions of their lots down in the valley where at present disintegration and diffusion takes place without being a nuisance to any one, though when the population of the town has increased and this flat becomes a residential portion, a nuisance will be created; this condition of affairs, although quite possible within the law yet, is not such as is considered proper by sanitarians.

The foregoing is the situation as regards the sewerage of the town at present, and although the plans of Mr. Chipman are submitted to the Board, yet it is not proposed to follow out the engineer's report; the town council has at present in contemplation the following work as per public notice:—

TOWN OF BRACEBRIDGE.

Notice.

Notice is hereby given that under and pursuant to the provisions of "The Consolidated Municipal Act, 1903," and amending Acts, the Municipal Council of the Corporation of the Town of Bracebridge intends to construct sewers for sanitary or drainage purposes upon the streets and between the points shown in the schedule hereinafter written, the cost to be paid for by thirty annual special assessments as local improvements.

And to make such assessments against the assessable real property benefited thereby, which is the property abutting and fronting on such streets.

And that unless a petition against the proposed works and special assessments signed by a majority of the owners of such real property (to be ascertained under and pursuant to the provisions of the said "The Consolidated Municipal Act, 1903," and amending Acts) representing at least one-half in value of the real property to be assessed in each case, respectively, be presented to the said council within one month after the last publication of this notice in the newspapers published at Bracebridge and known as "The Muskoka Herald" and "The Bracebridge Gazette," such last publication being intended to be on Thursday, the 21st day of June, 1906, the proposed works will be undertaken and the special assessments made by the said council.

Schedule.

Street	Point of Commencement	Termination
James	McDonald street	Jane street
James	South side gully	Mary street
Ann	James street	Manitoba street
Mary	James street	Manitoba "
Manitoba	Monck road	Dominion "
McMurray	Buller Avenue	Manitoba "
Market	Ontario street	Manitoba "
Quebec	Market street	Dominion "
Main	G. T. R. Station	Thomas "
Dominion	Ontario street	Quebec "

The estimated cost of the work, including disposal works and storm sewers, is $32,000.00, of which the amount to be raised by special assessment is estimated to be $17,000 and the amount to be paid by the municipality $15,000.

Dated this 14th day of June, 1906.

ALEX. C. SALMON,
Town Clerk.

It will be observed the notice does not specifically provide for the carrying of the sewage any further than the outlet of the present unauthorized system, although I was informed it was proposed to convey the sewage around from St. Thomas to Perry Street and run the sewage into the flume of the power house where it will pass through the turbines.

In view of the fact that the plans as submitted are not the ones which the council propose to follow out I would recommend that the Town Council of Bracebridge be requested to submit the proper plans to this Board, and further that this Board require that immediate provision be made by the council for the partial treatment of the sewage in a tank of sufficient capacity as to hold at least 24 hours effluent and that the present outlet of the unauthorized McMurray Street sewer be closed, the sewage from this section being diverted into the portion about to be constructed.

In view of the fact that precautions have already been adopted to keep pure the waters of the Muskoka Lakes, of which the Muskoka River is a tributary, by preventing the empting therein of polluting matter, the two tannery companies operating in the town should be ordered by this Board to discontinue the emptying of factory waste and excrement into the river, and instructed to provide for the treatment of the same upon the company's premises, and only effluent satisfactory to this Board should be permitted to empty into these waters.

The town council must clearly understand that when called upon by this Board they shall provide for the secondary treatment of the sewage in a manner approved of by the Board.

APPENDIX A.

Report upon a System of Sewerage for the Town of Bracebridge.

By WILLIS CHIPMAN, C. E.

TORONTO, December 31st, 1900.

To the Mayor and Council
of the Town of Bracebridge.

GENTLEMEN.—As soon as possible after receiving your instructions to report upon a system of sewerage, and prepare a general plan, I engaged F. J. Robinson, C. E., of Barrie, to take the levels and make surveys necessary. On the completion of his work, I visited Bracebridge in August, and went over the town, afterwards engaging J. Galbraith, C. E., to make some further surveys. I made a second trip to Bracebridge in the latter part of September and a third the first of November.

When entrusted with this work, I fully expected to have sent in my report early in the autumn, but circumstances conspired to delay its completion until the present time.

If there be anything in the report that I have not made clear, I will be pleased to furnish any explanation required.

Location.—The Town of Bracebridge is situated at the junction of the two main branches of the Muskoka River, which is navigable for steamers up to this point from the far-famed Muskoka Lakes. The main line of the Grand Trunk Railway from Toronto to North Bay passes through the town, the distance from Toronto being 122 miles, and from North Bay 105 miles. It is about six miles from Lower Lake Muskoka by the river.

Population.—The population of the town is now claimed to be about 3,000 and there is every indication of a steady growth. Bracebridge is practically a county town, with court house, jail, registry office, etc.; it is the market town for a large agricultural area, and has important manufacturing industries; while its location is such, that it must attract many who desire to secure pleasant, comfortable homes.

You now have all the modern conveniences and improvements of town life excepting sewerage, good roadways and permanent sidewalks. In the past your citizens were far sighted enough to not grant valuable franchises to water and light companies. The town now owns and operates its own water works and electric light system, and at the present time an important power and light plant is being developed in the town, by the town for the town.

Topography.—The county buildings, the town hall, churches, schools, and the larger part of the residential portion of the town are situated on a plateau, lying west of the north branch of the river, with an elevation varying between 100 and 130 feet above the river at the steamboat landing. This plateau rises abruptly from a level, sandy plain to the west. This plain has an elevation of about 45 feet above the lower river, and drains westerly to Beaver Brook, outside the corporation limits.

On this plain are the Agricultural Park, a few good residences, and in the southerly part on the banks of the river, the large tannery of the Muskoka Leather Co.

The main street of the town, called Manitoba Street, crosses the plateau diagonally, descending the east face to the head of the falls on the north branch. Practically all of the shops, offices, hotels and places of business are on this street between the face of the plateau and the head of the falls. The G. T. R. station and a large hotel are also located below the plateau on the bank of the upper river.

On the low ground between the north branch and the south branch, are located two important manufacturing concerns, the Beardmore Tannery, and Shiers' Lumber Mills and Yards. On the street between them are located the cottages of the workmen.

Along the east bank of the north branch are many detached residences, some of a better class.

Soil.—In the sand plain and on the plateau, to the northeast of it, the soil is in general a fine sand, easily excavated when dry, but becoming troublesome from caving when wet. In the sand plain the subsoil water will be struck in places at a depth of four feet, but it is generally found at five or six feet and in small quantities.

Ridges of gneissoid rocks of the Laurentian formation crop out at many points in town. One ridge forms the western face of the plateau, another the east face, this latter being covered with clay towards the south. The most important rock exposure is that lying between the plateau and the river, along Manitoba Street, and to the south of it. This is the only part of the town where expensive rock cutting will be required for sewerage purposes.

Muskoka River.—I have been informed that the dry weather flow of the north branch at Bracebridge has been found to be 13,500 cubic feet per minute by the gaugings of engineers.

The maps of the Province issued by the Government are so crude and so incorrect, that it is impossible to calculate from them the area drained by either branch af the Muskoka.

If the dry weather flow be as above given, the average flow cannot be less than 40,000 cubic feet per minute.

The north branch has a fall of 53 feet in a distance of 1,600 feet below the Manitoba Street bridge at ordinary stages of the river.

Upon the foregoing assumption, there should be available at the falls a total of 1,500 horse power in dry weather.

The dry weather flow of the south branch may be assumed to be about the same as that of the north branch, thus giving a flow of 27,000 cubic feet per minute below the confluence of the two branches in dry weather.

About 2,200 feet above this confluence on the north branch, is the steamboat landing, immediately above which the river opens out into a basin about 500 feet wide and extending from the landing to the foot of the falls, a distance of 800 feet. This basin is not navigable as it contains shoals formed of sawdust and other matters in suspension that have passed over the falls.

At the crest of the falls there has been placed a dam to raise the water a few feet, which produces slack water in the river above for some miles.

In low water the velocity of the current in the river below the confluence of the two branches is approximately one mile per hour, and above the confluence to the basin half this. Above the falls it is much less.

In high water the lower river is about five feet higher than in summer, and the velocity must then be much greater, probably double or three times what it is in dry weather.

Water Works.—Water works were constructed in 1894, the supply being taken from springs about a mile northeast of the town, from which it flows by gravity to a brick tank reservoir adjacent to the pump house, which is situated at the head of the falls. The pumps are operated by water power, the service being direct pressure. If the tank supply becomes exhausted, water can be drawn directly from the river.

There are now about eight miles of water mains, sixty-two fire hydrants, and three hundred and forty services.

Sewers Necessary.—No town can afford to be without a system of sewers. Your citizens cannot take full advantage of the water works system without sewers to carry away the fouled waters.

The ordinary privy pit is probably the most offensive abomination now to be found in the smaller towns and villages of the Province. Their use, however, is so universal that it will take years to convince the people that they are a nuisance that must be abolished, notwithstanding the fact that their construction is now prohibited by law.

Dry earth closets may, by proper management, be maintained in a sanitary condition, but they cannot dispose of the liquid house wastes, which are more offensive and dangerous than the solid matters.

It is frequently stated that a sewer system can be of little use or benefit to those who cannot afford to put in closets, baths, etc. This statement is an erroneous one. Without sewers cellars cannot be drained, and this is an important matter in Canada. By setting up a properly designed slop hopper in the yard or in an outhouse, all kitchen slops, dish water and chamber slops may be discharged into the sewer system, but a dry earth closet will also be necessary.

Bracebridge now has no sewer system. On some of the streets drains have been laid for draining cellars, some of tile, but the most of them of wood. In many instances the waste pipes from sinks and baths have been connected with those cellar drains, with the result that sewage is now finding its way into small leaky drains that were not designed to carry sewage, and what is worse these drains are occasionally given outlets into the roadside ditches. A proper system of sewers with water tight joints would remedy all this.

Storm Water.—This term, as used by engineers includes the water that falls during rains, and the water produced by the melting of ice and snow. On the streets of a town, this water is frequently liquid mud carrying gravel, sand, sticks, leaves, vegetable refuse, and other substances that are not sewage, and that will not decompose if not mixed with sewage. Storm water should as a general rule, be conveyed to an outlet in a separate sewer from that in which the sewage proper is carried.

Bracebridge is favorably situated for the disposal of storm water. By the construction of a few short tile sewers, all inconvenience from storm water will be remedied, but it will be necessary to construct a large ditch or drain from the vicinity of the Agricultural Park to the river or to Beaver Brook. The level sand plain is now badly in need of subsoil and surface drainage.

I am inclined to favor the construction of an open ditch from Beaver Brook along Dill, Wellington and Ontario to Victoria, or of a drain from the river to Dill on the line of Victoria Street; thence along Dill, Wellington and Ontario to Victoria.

System to Adopt.—In the older cities and towns of Europe and America, the universal custom until recent years, was to discharge all drains into the nearest watercourse, which when they became too foul to be left in their natural condition, were closed in or converted into large trunk sewers. This system of sewerage is called the combined system, that is, the street water and sewage are combined. This system is open to many objections, number one being, that as the city increases in size, the trunk sewer becomes too small, resulting in the flooding of basements and cellars, not merely with storm water, but with street water mixed with sewage. Law suits are of frequent occurrence in the older cities from this cause. A second objection to this system of sewerage is the unsanitary condition of the sewers during a great portion of the time. A heavy rainfall will carry into the sewers sand, mud, leaves and other street detritus. Catch basins which are built to intercept these matters, fail to collect everything, and if they are made water tight they will in a short time become offensive, and if they leak the contents may find their way into the adjoining buildings.

The mud, etc., carried by storms, tends to form dams in the sewers with ponds intervening. The domestic sewage which is a comparatively constant stream, flowing through the sewer in this condition, saturates the mud with sewage, and in a short time offensive odors are produced.

This condition of affairs in our climate may be maintained for weeks, and as sewage commences to decompose in about two days, it is evident that foul odors will arise. A visit to any city in America during the summer months that is sewered on the combined system, will demonstrate that this is no theory. In Toronto the stench from the sewer openings is at times very offensive of not dangerous to health. Flushing by hose may remove the deposits and again it may not. A heavy storm will do more towards removing them than the flushing by hose, but storms of sufficient duration to be effective are not frequent, and may not occur when the sewers require flushing. Another cause of the foulness of the combined sewers is the fact that during rains, a considerable part of the interior of the sewer may become covered with sewage. At the end of the rainfall the sewer is left wet with sewage and decomposition or fermentation follows. Another objection to the combined system is the great cost. A rainfall at the rate of one inch per hour in quite common in Canada, and a rate of more than two inches per hour has been recorded. One inch of rainfall on one acre of ground represents 3,600 cubic feet of water, which would give a flow of one cubic foot per second per acre in a sewer

A twelve-inch sewer pipe running full, having a fall of one in 300, would be required to convey the rainfall at the rate of one inch per hour from an area of two and one half acres.

This will give an idea of the size of the sewers that would be required if the sewers were designed to take all the rainfall. In the separate system, sewage proper is conveyed to a suitable point of disposal by one set of pipes, and the storm water is conveyed in another system of drains or storm sewers. Storm water as a rule causes no inconvenience, until the flow cannot be carried in the road gutters, that is, it may be allowed to flow for about two blocks upon the surface, before it becomes necessary to take it underground to an outlet. These underground storm water drains need not be laid at so great a depth as the sanitary sewers for carrying the domestic sewage, and they may be discharged into the nearest watercourse without creating a nuisance as these storm drains carry no sewage and therefore no decomposition can arise at the outlet nor in the sewers themselves. As a general rule such storm sewers are short and inexpensive.

The quantity of sewage produced upon one acre of ground in the most densely populated part of a city does not exceed 500 cubic feet per twenty-four hours, or say twenty cubic feet per hour. This is the average, and the maximum would not exceed the rate of sixty cubic feet per hour, or one cubic foot per minute. This is one-sixtieth part of the storm water flow, that is, the area of the sewers for carrying the sewage only, need not be more than one-sixtieth the size of the storm water sewers.

A nine-inch sewer having a fall of one in 300 feet, will discharge at the rate of 200 gallons per minute, or at the rate of 288,000 gallons per day when running half full.

This represents the sewage flow from a population of about 4,000 people, all using the sewers. If every building in Bracebridge were connected with the sewer system, if every person used water from the water works, and if all the sewage could be collected into one main sewer, one nine-inch pipe sewer would serve the entire population, if all storm water were excluded. On a main business street of a town there are generally to be found a few buildings where it would be a great convenience if the roof water were turned into the sanitary sewer, but where possible this roof water should be turned into the storm sewers.

The separate system has many advantages over that of the combined. The sewers are so small that they can be flushed out daily by automatic flush tanks, which require a much less quantity of water than that necessary to flush by hose. The ventilation of the sewers can be easily effected, and there are no foul odors emanating from the sewer system.

Sewage Disposal.—Although the water supply for the town is not now taken from the river, it is possible that in the future a portion of the supply at least may be taken from it, from some point above the pump house. Above the dam, the river in summer has a very low velocity, and if sewage were discharged into it, local nuisances might be produced at the points of discharge.

In my opinion all sewage should be rigidly excluded from the river above the falls.

It has been determined by experiment that if the sewage be diluted in water in the proportion of 1 to 70 no decomposition will occur, and no nuisance created. If the proportion of sewage is increased to one-twentieth decomposition is certain to follow, while between these two proportions, decomposition may take place or it may not.

A population of 3,000 people all using the sewers will produce about 30 cubic feet of sewage per minute. If this be thoroughly diluted with the dry weather flow of the river, which is given as 13,500 cubic feet per minute, the dilution would be 1 to 450, or more than ten times that demanded in the Chicago Drainage Canal. If sewage were discharged into the basin between the falls and the steamboat landing, a nuisance would arise at the outlet, but if the sewage be discharged immediately above the foot of the falls, the diffusion would be uniform throughout and no nuisance could possibly arise.

If the sewage were disposed of in this way, I am of the opinion that it could not be detected at the steamboat landing. Slight deposits might form in the basin, but these would be scoured out by every freshet.

As, however, there may be sentimental objections to the discharge of the sewage into the river at any point without purification, I have included purification works in my scheme, at the proposed main outfall.

The sewage from the small area south of the north branch near its confluence with the south branch, may be discharged directly into the river through a submerged pipe, also the sand plain area through similar pipe at Victoria Street.

In the residential area lying on the southeast side of the north branch above the falls, the sewage may be conveyed across the river and discharged into the main sewer on the northwest side of the river.

Purification Works.—If you decide to purify the sewage before discharging it into the river, I am of the opinion that the removal of the suspended matter will be quite sufficient. Land treatment gives better results than any other known process. In Bracebridge you have a suitable tract of land lying north of Ontario Street and west of the plateau, but the cost of building a main sewer from the vicinity of the water works pump house to this area, and the cost of an effluent sewer from there to the river would be greater than the town can afford.

The proximity of a Public School in an adjoining municipality might also lead to litigation, which it is desirable to avoid; not that the works would be offensive if properly operated, but no doubt all illness in the vicinity of the sewage beds would be attributed to them, also all offensive odors.

After visiting the principal sewage disposal works in Great Britain, the United States and Canada, I have concluded that closed septic tanks located at the proposed sewage outfalls would prove best suited and cheapest to adopt.

For many years one septic tank at the main outfall would be sufficient, this to have a capacity of one day's flow of sewage.

By the septic tank process nearly all of the matters in suspension are removed by the action of bacteria. The effluent from the tank will be darker in color than the raw sewage, but it soon loses its offensive color. By applying this effluent to land, or prepared beds of coke or other suitable materials, a further purification may be effected, the final effluent approaching the river water in purity, but this degree of purification is not necessary and it would therefore be a needless expense.

If all the sewers shown on the plan were now laid and connections made with every building, the quantity of sewage delivered at the main outfall would be about 150,000 gallons per day, but for several years it will be less than half this, and in my opinion a septic tank to hold 50,000 gallons will serve for five years at least, and possibly for ten.

Tannery Refuse.—For some years after the establishment of the tanneries a large amount of refuse found its way into the river, but the manufacturers are now utilizing a considerable part of what they formerly threw away.

The disposal of tanning wastes in such a way as not to cause a nuisance in the river is a problem that the town is interested in, but it is a matter that the tannery companies should carry out. Large settling and screening tanks should be built and the liquid drawn off by floating arms after settlement. Part of the sludge that settles in the tanks will be found to contain substances of sufficient value to pay for operating the tanks and disposing of the sludge. Valueless decomposable matters should be buried or burned and not discharged into the river.

Main Sewer.—That portion of the town lying north of Ontario Street and west of Dominion and Mary streets may be drained in either of two directions southeasterly down Manitoba Street or southwesterly down the street leading from Quebec Street to Victoria Street, known as Tannery Hill.

As, however, the southwest part of Manitoba Street, Main Street and Thomas Street, representing the business portion of the town, now require sewers more urgently than any other part of the town, I have concluded to drain the plateau southeasterly into the main sewer for this business part of the town. This main sewer will commence at or near the proposed new power house, thence along Perry Street and under the G. T. Ry. bridge to Manitoba Street; thence through the Leishman mill yard and along the river bank to Thomas Street; thence up Thomas to Manitoba. The route shown on the plan may be slightly varied between the outfall and Thomas Street to avoid rock or other obstructions.

From the outfall to Manitoba Street, the trenching will be in solid rock, but the depth of trench need not exceed four feet, and less than that will do if cast iron pipe be substituted for tile. This is a matter of detail that can be decided upon before calling for tenders.

I have shown on the plan two other outlets, but they cannot be called main sewers as each sewer serves a very small area.

Laterals.—Into the main sewer, the sub mains and laterals will discharge. One sub main will cross the river at the Toronto Street bridge, and another is shown crossing the iron bridge at the head of the falls, but this latter will probably not be required for some time.

Manitoba Street from Thomas Street to Ontario Street, and Ontario from Manitoba to Dominion are the most difficult streets in town to sewer, as on each of them the solid rock is at the surface of the ground. On the plan I have shown a sewer along the centre of each street, but it is possible that by following depressions in the rock, the buildings on the north side of Manitoba Street may be drained more cheaply by running private drains from the rear of buildings to the main sewer, and the buildings on the south side drained into a shallow sewer along that side of the street.

On Ontario Street, the lump of rock near Manitoba Street should be lowered, the depression to the west filled up, and a sewer laid in the centre of the street. If this be considered too expensive, a small sewer may be laid southerly along the course of the box drain now in use for carrying street water, connecting with the main sewer near its outlet.

Plan.—The general plan shows the location of each proposed sewer, its direction of flow, and size. I have shown upon the plan in small black figures the elevation of the surface of the ground, also the elevation of the river at summer level. By adding 700 feet to these figures, the elevation above mean sea level is obtained.

Estimated Cost.—The following is my estimate of the cost of such sanitary sewers as I now consider necessary:—

Main Sewer	Length	Cost
Outfall	100 feet	$ 300 00
Perry	650 “	1,400 00
Mill Yard	1,100 “	2,000 00
Thomas	450 “	600 00
	2,300 feet	$4,300 00
Sub-Mains and Laterals		
Main Street, to G. T. R. Station	450 feet	$ 600 00
Manitoba, Perry to Post Office	650 “	2,200 00
Manitoba, Thomas to Post Office	250 “	450 00
Manitoba, Thomas to McDonald	2,700 “	3,300 00
Mary	330 “	450 00
Ida	300 “	400 00
Ann	550 “	800 00
James	900 “	1,150 00
Dominion	800 “	1,000 00
Quebec	850 “	1,050 00
Kimberly (South)	500 “	650 00
McMurray (South)	900 “	1,150 00
Kimberly (North)	550 “	700 00
McMurray (North)	700 “	900 00
Willis	200 “	300 00
John	850 “	1,100 00
	11,580 feet	$16,200 00
Victoria outlet	400 feet	800 00
Victoria	900 “	1,200 00
	1,300 feet	$2,000 00

Total length 15,180 feet, or 2.87 miles.

Total cost of sewers proper $22,500.

If disposal works be erected at the main outfall two masonry septic tanks with a combined capacity of 50,000 gallons would cost about $1,500 in addition.

The quantity of sewage entering the river at the other outlets will be so small that disposal works will be unnecessary.

Payments.—In the older cities and towns the total cost of their sewer systems as a general rule equals the cost of their water works, but in the smaller towns the water works system is extended in advance of sewer construction. for the obvious reason that no direct revenue can be obtained from the sewers. Many towns, however, have of late years put in water works and sewers at the same time, thus increasing the revenue from the water works, and saving the inconvenience of opening up the streets a second time.

Bracebridge is not on the whole an expensive town to sewer, and your water works system is no burden.

In my opinion sewage purification works are not necessary immediately, and when demanded they may be added at a comparatively small expenditure.

To meet the cost of the proposed sewer system, I would recommend that the town raise by by-law from $10,000 to $15,000, and that the balance be met by a frontage tax assessed upon each side of every street where sewers are constructed, no frontage tax to be assessed until a sewer is constructed.

I estimate that if the town raises $10,000 by general by-law that a frontage tax of 65 cents per lineal foot will be necessary, and about 50 cents per lineal foot frontage if $15,000 be raised by the town.

The sum raised by the town will construct the main sewer, the disposal works (when required), and will pay for rock excavated, street crossings, exempt property, corner lots, etc.

This method of assessment is in operation at many places in Ontario and has given entire satisfaction. It has many advantages:—

(1) The owners along the street sewered pay for the privilege while those on streets not sewered pay only a small sewer tax.

(2) Extensions can be made at any time upon petition of the owners requiring a sewer, or by the town as a sanitary measure.

(3) Sewers are not clamored for until they are required by the majority on the street.

(4) The book keeping necesasry is simplified, as every owner who has a sewer on the street where his property is located, pays the same frontage tax per year.

A frontage tax of 65 cents per foot will amount to five cents per foot per year for twenty years, and forty cents will amount to three cents per foot per year for the same period.

Conclusion.—In conclusion, I would strongly advise that the town should not proceed with the construction of macadamized roadways or concrete sidewalks until after the sewer system has been constructed, and the connections laid from the sewers to the street lines. Several towns throughout the Province are now foolishly spending money upon their roads and streets before constructing sewers, but it must be obvious to any thinking person that they are placing the cart before the horse.

Report *re* Sources of Water Supply for Village of Chesley.

By DR. R. W. BELL, Medical Inspector of the Beard.

As requested by your secretary I visited the Village of Chesley on June 28th inst., to inspect several suggested sources of water supply. Dr. Stewart, M. H. O., very kindly drove me over the whole ground.

1st. The source proposed by John Galt, C.E., near the bank of the Saugeen River at the lower end of the park, appears to be one from which an ample supply is likely to be obtained by artesian wells, and such as should be free from contamination, but provision must be made for proper disposal of the sewage, and not into the river, in or above the town.

2. Another source is from artesian wells near Scheumacher's old brewery, a short distance from town, and which is the highest point in the neighborhood.

Here there is a well now, with fine water, 150 feet deep, through 90 feet of clay and 55 feet of gravel, with a four-inch pipe, and water rises to within 80 feet of the surface. Continuous pumping does not lower it.

3rd. At Scone one mile east, there is a good dam, holding water in a pond on the north branch of the Saugeen River, for electric light power. This source has also been contemplated, with use of filtering beds. There would be difficulty in getting good beds, and I would fear contamination from adjacent barnyards at the point proposed. The sufficiency of the supply is also questionable.

4th. To the west of the village, near the creamery, is another source suggested, obtaining the supply from numerous springs, but here again there is more or less danger of pollution, besides being more expensive.

I was pleased to find that there are no pit closets nor cess pools allowed in the village, the dry earth system being universal, and well looked after by a corporation scavenger, but the sooner a good water works system is put in, combined with satisfactory sewerage, the better, the sewers being already constructed ready for use, over a considerable area, but only used for surface and cellar drainage at present.

On the whole the points proposed for the artesian wells, either near the bank of the river below the school in the park, or near the old brewery would be satisfactory from a sanitary point of view.

APPENDIX A.

Report upon a System of Water Supply for the Village of Chesley.

By W. J. BOWERS, Consulting Engineer, Chief Assistant to John Galt, C. E. and M. E, Toronto.

GENTLEMEN,—According to your instructions transmitted through your village clerk, I visited Chesley, arriving there on the morning of May 3rd, 1906, remaining until early on morning of May 5th, 1906, and have arrived at the conclusions hereafter stated.

Location.—The built up part of your village is situated on the south side of the north branch of the Saugeen River, but there is a part of the village, not so well built up, on the north side of the river.

Quantity of Water Required.—Your population at the present time is in the neighborhood of 2,000. You will no doubt be shortly applying for incorporation as a town.

It is desirable in designing a water works system to allow for the probable increase in population, and I consider that your system should be designed for a population of 3,000.

Source of Supply.—After examining into the several suggested sources of supply, I have come to the conclusion that you will obtain an abundant supply of pure water by driving one or more eight-inch wells close to the edge of the river at the southwest corner of the town park, to the same strata to which the well at the school was driven. I have no doubt that one well will be sufficient for years to come.

It is very likely that you will have a flowing well, as the level of ground near the edge of the river is below the level of the water in the school well. That water is to be obtained here is evident from the fact that there are now two flowing springs on Messrs. Krug Bros.' property a short distance to the south of this point, and another flowing spring two or three hundred feet north of the proposed site of the wells. From the fact that the water in these springs rises to a point several feet above the level of the water in the river, it is evident that there is no connection between the river and these springs.

Pumping Station.—As it will be necessary to supply the water at a considerable pressure to the consumers, and also for fire purposes, some method of pumping must be resorted to. I would favor the use of a duplex steam pump for this purpose, the steam to be supplied from two return tubular boilers.

The pumping station station should be located close to the well or wells and at as low an elevation as possible commensurate with the probable rise of the water in the river during a freshet.

Water Tower.—As it would be costly and inexpedient to operate the pump all the time it will be necessary to have an elevated reservoir to keep up the supply while the pump is not running, and I would suggest for this purpose a water tower located on the lot on King Street, on which the town weigh scales are now, or on some other lot in the immediate vicinity. This water tower should be of such a height that the pressure in the mains on the high ground in this part of the town will be sufficient for fire pressure. If the top of the water tower be 120 feet above the level of the ground, the pressure in this part of the town will not fall below 40 pounds per square inch, even when the tank is almost empty, and probably not below 55 pounds in the lower part of the town. The pump should be started to keep up the supply in the water tower as soon as possible after an alarm of fire has been given, and if it is necessary to have a higher pressure than that due to the height of water in the water tower, the latter may be shut off from the distribution system when any pressure within the limits of safety could be obtained in any part of the town.

Estimated Cost.—The cost of the system with mains shown in full lines on the plan, which accompanies this report would be approximately thirty thousand dollars, made up as follows:—

Distribution system, including piping, valves and hydrants	$12,000
Pump house	3,500
Water tower	7,500
8-inch well and connections	600
Pump and connections	2,000
Boilers (2)	2,500
	$28,100
Engineering and contingencies	1,900
	$30,000

The distribution system as shown in full lines on the plan gives efficient fire protection for the whole of that part of the town south of the river, and even for part of the town on the north bank of the river, and domestic supply on all streets on which the mains are laid.

The extra cost to complete the distribution system as shown by the dotted lines, is comparatively small, being only eight thousand two hundred dollars, or if the river crossing and that part of the system north of the river be omitted, six thousand dollars.

I cannot impress upon you too strongly, the advisability of putting in the complete system at one time, as by doing so, you will have the work done much more cheaply and in a better manner than you can expect of you put in only the limited distribution system at the present time, and the balance in small sections from time to time, and you will have a much large revenue from the beginning and a much shorter time until the water works become self supporting.

The extra annual charges for the complete system would be very litle, only the extra amount to be paid into a sinking fund, as there would be no charges for maintenance.

Report *re* Water Supply for the Village of Bradford.

By Dr. R. W. BELL, Medical Inspector of the Board.

On June 25th, 1906, I visited the Village of Bradford for the purpose of looking over the proposed location of one or more artesian wells to supply the village with water for all purposes. The place shown me is on a hill on the farm of Mr. McLeod, about one mile north of the village, and is so located as to be free from all likelihood of contamination. The ground slopes away rapidly to the south and southeast, and a few yards away also to the north. Mr. McLeod's barns are situated about 100 yards east, and his residence a few yards further to the northeast, but here there is rapid drainage to the southeast and away from the proposed well location. The soil is a pretty stiff clay, and Mr. McLeod states his dug well in front of his house is 60 feet deep and always has eight feet of water in it.

The water would be pumped down and across a ravine, and over a lower hill to the south, on which is to be situated an elevated tank, to supply the village by gravitation. The proposed source of supply is all right from a sanitary point of view, the only doubt being as to a sufficient quantity.

APPENDIX A.

Report upon a System of Water Supply for the Town of Bradford.

By W. J. BOWERS, Consulting Engineer, Chief Assistant to John Galt, C. E., M.E.

After visiting Bradford three several times between April 20th, 1906, and May 12th, 1906, I have arrived at the following conclusions:—

Source of Supply.—I am of the opinion that an abundant supply of pure water can be obtained by driving one, or if necessary, two wells on McLeod's farm at approximately the point shown on plan.

Domestic Supply.—The water flowing by gravitation from this well or wells will give satisfactory pressure for domestic purposes in all parts of the village.

Your population is at present in the neghborhood of 1,000, but allowng for an increase to 1,500 and for a consumption of 100 imperial gallons per capita per day, the amount required would be 150,000 imperial gallons, or approximately 100 imperial gallons per minute, which I have no doubt would be obtained from one or at most two wells.

Fire Protection.—In case of fire, a much larger quantity of water would be required for a limited time than could probably be obtained by gravitation from the wells. To overcome this difficulty I would advise the erection, at the point marked on plan, of a wood tank 30 feet in diameter and 24 feet high, supported on a steel trestle 14 feet high. This tank would hold slightly over 100,000 imperial gallons, which would supply two first class fire streams, the number called for by the Fire Underwriters' Association for a place with your present population, for over four hours without at all interfering with your domestic supply, the latter being taken care of by the flow from the wells.

The pressure from this elevated tank would be sufficient for fire protection in the lower parts of the village. It would be considerably over 50 pounds per square inch at the corner of Holland and Simcoe Streets, even with two fire streams in use, and still higher lower down towards the railway station.

To obtain sufficient fire pressure for the upper parts of the village, I would advise that your steam fire engine be kept in a small brick building located as shown on plan, connections to the water main being brought up above the floor in this building so that the suction and discharge could be connected by short lengths of hose. This would obviate the necessity of using special hydrants with steamer connections, and also of dragging the steamer around the town in case of fire. The steamer could be kept attached at all times and within a very short space of time after the alarm of fire was sounded steam could be got up and any pressure which the mains or steamer would stand be obtained in any part of the town.

The operation of the steamer would also greatly increase the flow from the wells and thus make it practically impossible for there ever to be any dearth of water for fire fighting purposes.

Estimate of Cost.—I would estimate the cost of a system as outlined above with mains as shown on plans, which accompany this report, to be twenty-eight thousand dollars ($28,000), made up as follows:—

Brick steamer house	$1,500
Wood tank with steel trestle	3,500
Two eight-inch wells with connections	1,200
5,550 lineal feet eight-inch wood pipe in supply main	4,800
3,250 lineal feet eight-inch cast iron pipe in distribution system	3,500
10,850 lineal feet six-inch cast iron pipe in distribution system	8,700
6 tons special castings	400
33 hydrants	1,300
Gate valves	800
Land and land damages	500
Engineering and contingencies	1,800
	$28,000

Distribution System.—The distribution system covered by the foregoing estimate and shown on plan, will give efficient fire protection to all of the built up parts of the village, and domestic supply on practically all of the streets which are sufficiently built up to ensure a revenue.

Report *re* Source of Water Supply for Village of Port Elgin.

By Dr. R. W. BELL, Medical Inspector of the Board.

Port Elgin having submitted a plan and specifications for a water works system, your secretary instructed me to visit the proposed source of supply and investigate the possibility of its pollution, etc. This I did on 29th June, 1906, and was shown over the location by Messrs. Geddes & Munro, reeve and clerk of the village.

The source of supply is Lake Huron, and the water to be obtained by filtering through the sand into a gallery to be constructed on the beach. The beach here is a sand flat, all formed within the last few years, a little above the water level and extending about 150 yards out from a high bank formerly the shore line. A few yards north of the proposed gallery is a wharf providing accommodation for several vessels at one time, and a short distance out is a breakwater extending to the shore at its north end, forming a small harbor with its entrance from the south. Within 200 or 300 yards to the north are several buildings, the drainage from which must find its way to the harbor, besides a large saw-mill just erected. On the wharf are the storehouses, and the G. T. Ry. is putting in a spur line directly behind the wharf to its south end, which is within a few yards of the gallery. About 150 yards east at the foot of the high bank is a moderately large summer hotel, from which a streamlet or drain discharges into the lake within a few feet of the proposed supply. This whole flat belongs to the municipality, and because of the shipping facilities, both by rail and water, is very likely to be utilized for manufacturing purposes. All these possible sources of pollution in the future have to be considered. The drainage from the hotel can of course be stopped, but it is going to be difficult to prevent pollution of the harbor water, from vessels and the other sources mentioned, and from it the shore line for some distance south, as westerly winds prevailing will tend to keep the polluted water inshore, and with increased shipping, which the Port Elgin people anticipate, the contamination will increase.

The question of sewage disposal must soon follow, on the installation of a water works system, and as the lake is considered, and was mentioned to me as the most probable place into which the sewage would be discharged, I think something more definite should be known regarding it, before deciding the exact point of water supply. In any case unless positive assurance is given of the cutting off of the present sources of pollution, and the preventing of any future ones, if the gallery system is to be adopted, it should be constructed at some other point where the supply will be assuredly free from contamination.

APPENDIX A.

Report Upon Water Works of the Village of Port Elgin.

By WILLIS CHIPMAN, C. E.

As a result of my visit to your village on April 13th and 14th, I beg to submit for your consideration the following report upon a system of water works with estimates of cost.

Your village is most favorably situated for water works and drainage. Lake Huron, distant less than a mile from Goderich Street, the principal business street of the village, will provide an unlimited supply of the purest water in the world, the soil and subsoil are easily excavated, and the ground and street slopes are such that good surface drainage is provided. Along the side of the village a ridge of sand hills attains an elevation of about 140 feet above the lake, and 45 feet above Goderich Street. The hills will provide an ideal site for the water tower or stand pipe.

Although Lake Huron is near at hand and a most desirable water for all purposes, it would be an expensive undertaking to lay a submerged iron intake pipe from the shore line out into the lake, a sufficient distance to secure pure water, free from turbidity during storms.

I am of the opinion that you can get a pure clear supply by constructing a gallery on the beach. The quantity of water that will filter into such a gallery cannot be estimated in advance, but the greater its length the greater the supply. It can be extended as the demand increases. This gallery will be much cheaper than an intake pipe, and will give a clear water at all times. You may lay an intake pipe at any time in the future if you consider it necessary or desirable.

At first I favored locating the gallery on the beach near John Street, or northwest of the north end of the outer pier, but the gravel at this point is coarse, and I am informed that there is a probability of striking clay and hardpan at that point within a few feet of the surface. The advantages of this site are as follows: An intake from this point would not be in danger of injury, a shorter pipe necessary to reach deep water, less possibility of village drainage reaching the inlet.

If the gallery were constructed on the beach between Mill Street and Gustavus Street, there would be a crtainty of finding a depth of over ten feet of sand through which the water would filter, the length of the force main would be the shortest possible, and the pump house would be most advantageously situated for obtaining fuel.

I have examined the ponds fed by springs, lying between Gustavus Street and Catharine Street, along the east side of Spring Street. These ponds formerly supplied water to a tannery abandoned some years ago. This pond might yield a sufficient supply for the domestic supply of the village, but I doubt it. The flow should be carefully measured during the driest part of the year to determine the yield. The pond itself would however serve as a reservoir to draw upon for a fire supply, in which case it would be necessary to empty it, clean it thoroughly, fill in or deepen the shallow places and fence it. A pipe may be laid from this pond to the pump house at any time in the future.

In my estimate of cost I have included water mains and fire hydrants in the following streets: Mill Street from the pump house at the harbor to the water tower or stand pipe near Lennan Street, Market Street from Saugeen to Wellington, and Gustavus from Stafford to Hilkar, a total length of 14,000 feet of piping and 30 standard double nozzle fire hydrants. By this arrangement of piping fire protection will be given practically to the entire built up section of the village. Domestic supply may be given to the other streets by laying galvanized pipes from the large cast iron pipes, but these extensions should not be made until a revenue be guaranteed sufficient to warrant the expenditure.

In my opinion your water tower or stand pipe should be erected on the hill near the intersection of Mill Street and Lennan Street, east of the High School. Without a reservoir of some kind it would be necessary to pump continuously night and day, the year round, in which case two pumps would be requrel at once, and it would take two men at the pump house, one at day and one at night. With a reservoir the wear and tear of the machinery would also be less, and you would have some water in reserve at all times for a supply. You cannot afford to omit the reservoir.

A cylindrical steel tower or stand pipe about 16 feet in diameter and 60 feet in height would hold about 75,000 imperial gallons. A steel tank 20 feet in diameter and 20 feet high with semi-spherical bottom, supported on a steel trestle, 40 feet high would hold about 60,000 gallons of water and would cost about the same amount. By substituting a tank of wood about 18 feet by 18 feet, the cost would be decreased by $1,500, but this tank would only contain 28,000 gallons, but sufficient for more than a night's supply for 1,000 people.

I would prefer the steel stand pipe or steel tank to a tank of wood if you can afford it. The wooden tank might be replaced by a steel one in the future, but the trestle should be of steel of sufficient strength to support a steel tank.

This trestle would not require any changes when replacing the wooden tank with a steel one. The pumping machinery should comprise one compound duplex steam pumping engine of the underwriter standard, with a capacity of 750 gallons per minute for fire service against a head of 130 pounds pressure at the pump, which will give about 80 pounds at the hydrants.

Two boilers of 80 h.p. should be installed at first, and steam kept up in one boiler at all times. Without two boilers no pumping could be done in case of a fire occurring when the boiler was being cleaned or repaired.

The building should be of brick on concrete foundation, with concrete floors and metal roof, with small shed annexed for fuel. Some coal and wood should be kept on hand for use in case of fires. but no doubt you could arrange to obtain saw mill refuse for the ordinary firing, from the mill now under erection.

I would favor locating the pumping station and gallery at some point on the beach between Elgin Street and Gustavus Street. Before deciding upon the exact location I would advise you to sink two or three curb wells to a depth of about sixteen feet below the lake level, at different points, to determine the probable inflow through the sand. A large hand pump should be provided the well digger when at this work.

I estimate that the works above described and recommended will cost as follows:—

Well and gallery	$1,000
Buildings	3,000

Pumping engine, 700 gal. minute	2,000
Two boilers, 80 h.p. each	3,000
Force mains from pump house to water tower	9,000
Steel water tower 16 feet by 60 feet	5,500
	$23,500
6,000 feet of mains on Goderich Street and other streets	6,000
30 fire hydrants and valves	2,000
	$31,500
Engineering superintendence, legal, advertising, etc.	1,500
Total	$33,000

By substituting a wooden tank for the steel one, a reduction may be made of $1,500, and by omitting one boiler a further reduction of $1,500 may be made; or you may omit for the present a sufficient quantity of piping to reduce the estimate to $30,000, but I am of opinion that you can afford to submit a by-law for $33,000.

The revenue from consumers should pay the operating expenses from the first, and the reduction in insurance rates and protection afforded to the business section of the town, should equal the yearly interest and sinking fund charges.

Report upon Proposed System of Water Works of the Town of Gravenhurst.

By WILLIS CHIPMAN, C. E.

Before preparing my report upon water works I considered it desirable to have certain levels taken to determine the elevation of different points in town, and the possibility of diverting drainage from Gull Lake. These levels were taken by my assistant in the latter part of May.

Location.—Your town has an attractive location on a sandy tract of land between Gull Lake and the southeast bay of Lake Muskoka, the latter lake being 80 feet lower than the former.

Several granite outcrops of rock occur in different parts of the town, but only a small percentage of the trenching for water pipes will be in rock, the greater part being sand and gravel.

The town is located on the Grand Trunk Railway one hundred and eleven miles from Toronto, and one hundred and sixteen miles from North Bay. A branch line about a mile in length connects the town station with Muskoka wharf where connections are made with the steamers on the lakes.

Water Supply.—For a population of 2,500 the quantity of water supply for domestic and manufacturing purposes should not exceed 250,000 gallons per day, but for fire purposes the fire underwriters require three fire streams at least, over and above the domestic supply, or about 900 gallons per minute.

The quality of the water should be above suspicion for domestic uses.

Either Gull Lake or Lake Muskoka would yield an unlimited supply, but the latter is now contaminated more or less with surface drainage, saw mill refuse, steamboats, etc., and will eventually receive the sewage from the town.

Gull Lake is a comparatively small body of water, only two or three miles in length, and on the average less than a mile in width. I am informed that there is no visible inlet, while a stream of considerable size flows out of the north end of the lake to the Hocrock River the greater part of the year, but I am of the opinion that in a dry season the stream would be trifling. As the variation in level in only about two feet it is evident that the lake is fed largely by springs. It is now unpolluted by sewage or drainage and can be maintained in this condition by taking ordinary sanitary precautions. No drains of any kind should be discharged into the lake; residences along the shore should be provided with dry earth closets; bathing and washing should be prohibited within a mile of the intake and parties wilfully fouling the water should be punished. With these precautions I have no hesitation in recommending Gull Lake as the source of supply, the water to be taken from a point not less than 1,200 feet distant from the shore line.

This intake should be laid under competent supervision and according to proper designs.

Pumping Station.—The pumping station should be erected adjoining the electric lighting station, so that the entire plant can then be operated by the same staff, and if steam be used one battery of boilers will serve both.

The steam boiler that furnishes steam to the electric light engine should be retired and placed on exhibition.

As the fire underwriters require that the water works pumping station and electric station be separate buildings, the boilers should be placed in the pumping station, a main steam pipe to be carried to the generator room.

For water works and electric lighting three 100 h. p. boilers should be installed in order that you may at all times have two in use, while the third may be under repair. Two boilers might do the work for one year, but space should be left for a third in boiler room. The old boiler might possibly be used for a short time if overhauled.

The pumping machinery should comprise one compound duplex steam pump, of 1,000 gallons capacity, with space in pump room for a duplicate.

The existing boiler room at the electric light station will be required for additional electric machinery.

It would be desirable to provide a small office in the water works pump house for the use of the engineer.

The present condenser and feed pumps may be connected with the pumping engine.

The building should be of brick with metal roof, the foundation walls to be of concrete.

If electric power be available for pumping it will not be necessary to instal two boilers, and the steam pump may be a simple duplex. In this case two motor driven pumps will be necessary, one of moderate capacity for domestic service, and a larger one for fire service.

As the cost of machinery will be somewhat greater in the electric driven plant I have included the cost of the electric motors in the cost of the power plant.

Reservoir.—Whether steam or electricity be adopted as the motive power for pumping, a reservoir is most desirable. As the highest part of the town is built upon, the only practicable reservoir would be a water tower or an elevated tank supported by a trestle. In your climate I prefer a water tower, commonly called a stand pipe, a simple cylinder of steel plates resting on a masonry foundation.

A standpipe 80 feet in height will give a good domestic pressure throughout the town. If built higher, the pressure would be increased at an additional expense for power.

For fire service the inlet to tower may be closed automatically or by a hand valve. I would suggest that this tower be erected immediately south of the Baptist Church and opposite the central fire station.

Distribution.—For fire protection, mains should be laid on the following streets:—

Bay Street from pump house to town wharf.
Muskoka Street from Brown Street to Church Street South.
Second Street from Brock Street to Harvie Street.
First Street from Brock Street to Sharpe Street.
David Street from Muskoka Street to First Street.
First Street from David Street to James Street.
James Street from First Street to Second Street.
Second Street from James Street to Phillip Street.
Phillip Street from Second Street to Fourth Street.
John Street from Bay Street to Brown Street.
Sarah Street from Bay Street to Farquhar Street.
Brown Stret from Sarah Street to Mary Street.
Farquhar Street from Austin Street to Mary Street.
Sharpe Street from Muskoka Street to Mary Street.
Main Street from Muskoka Street to G. T. R.

The length of piping of the different sizes would be as follows:—

3,000	feet of	10-inch.
3,350	"	8-inch.
6,900	"	6-inch.
2,600	"	4-inch.

Total 15,850 feet.

About 41 double nozzle fire hydrants of standard pattern will be required with necessary gate valves, etc.

Cost.—I estimate the cost of the proposed works as follows:—

Intake	$4,500
Pump house	4,500
Machinery	5,500
Water tower	8,500
Distribution	20,000
Service Pipes	2,000
Engineering and superintendence	2,500
Legal and advertising	500
Total	$48,000

I am confident that you can construct the work described for the above sum.

Revenue.—The revenue from your water works should pay operating expenses, if steam is used, from the first.

In five years you should have about 250 water takers averaging $10.00 each, or $2.500 revenue from domestic consumers only. You should allow about $1,600 a year for fire protection, and about $300 a year for street sprinkling, schools and other municipal purposes.

The operating expenses should not exceed $1,500 per year, $500 for fuel, $500 for salary and $500 for repairs.

This is no fancy estimate, but you can verify it by communicating with many places that have constructed water works during the last ten years. I would suggest that you write Midland, Port Hope, Newmarket, Barrie, Orillia, Bracebridge and Renfrew respecting financial matter *re* water works.

With electric power the financial showing would be better than with steam.

Note.—This report, together with the plans submitted, were approved of by the Board, subject to laboratory reports on the quality of the water being satisfactory.—C. A. H.

Report upon Proposed System of Water Works of the Town of Chapleau

By WILLIS CHIPMAN, C. E.

After a personal inspection of the town, and the proposed sources of water supply, I beg to present the following report upon municipal system of water works.

Sources.—Nebsquashing Lake, northwest of the town, will give an unlimited supply of unpolluted water, and if the intake pipe be laid southwest of the C. P. R. bridge there is no probability of future contamination from domestic sewage, as the lake flows from the southwest towards the northeast.

The water in this lake doubtless contains some vegetable organic matter, as it is dark in color, similar to the Ottawa River and other streams in Northern Ontario.

The river or lake that forms the east boundary of the town is smaller in area than the lake first mentioned, and two miles south from the railway there is now a large sawmill. The area of low ground around this lake is also larger than in the former. The North West Lake is in my opinon to be preferred to the East Lake as a source of water supply.

I examined the small pond situated about a mile south of the town, that has received considerable attention from the C. P. R. engineers during the last year. Mr. W. W. Benny, of the C. P. R. staff walked around one side of this pond while I walked around the other, but we failed to find either inlet or outlet. In my opinion the water in this pond would be found unfit for domestic uses, also that the pond would not yield a sufficient supply. This pond is surrounded by a moss bog, the bottom being a liquid mud from five to fifteen feet in depth. The area of the lake may be ten acres, about half of which is open water free from lilies and weeds. This pond is said to have an elevation of about 160 feet above the C. P. R. at Chapleau; sufficient to give a good domestic pressure but not sufficient for fires.

Green Lake, which is crossed by the C. P. R. about six miles southeast of Chapleau, has also been suggested.

The water in this lake is clear, similar to Lake Superior, but owing to the distance the cost of the main pipe from the lake to the town, even if no rock were struck, would exceed your present borrowing powers.

The town is built upon a level sand plain between the two lakes, with an average elevation of about fifteen feet above the water. Water of good quality can be obtained by simply driving down a well point to a depth of ten to thirty feet. I believe a supply for the town could be obtained by driving points or constructing an infiltration gallery entirely below the level of the lakes, but the quantity available could only be determined by experiments and tests that would cost a considerable sum and take time. Owing to the large number of privy pits and cess pools, the extremely porous sandy soil, and the level surface, the subsoil must now be polluted to a certain degree.

Analyses and bacteriological examinations might prove the supply at one time to be perfectly pure, but with rains following a period of dry weather the pollution might be serious. Unless an exceptional supply were struck the cost of the wells or gallery would exceed the cost of an intake pipe into the lake, by several thousands of dollars. The well water would be clearer, colder, and harder than the lake water, containing less vegetable matter, but more liable to be dangerously polluted.

Taking into consideration the first cost, the importance of fire protection, the quality of the supply for locomotive boilers, as well as the purity of the water, I have decided to recommend the North West Lake as your source of supply.

Pumping Station.—Your pumping station should be located as near as practicable to the source of supply. The building should be of brick, stone or concrete, with metal roof and concrete floor. It should comprise boiler room, engine room and coal shed. In general a brick chimney is included in the building.

The machinery should be of sufficient capacity to conform to the requirements of the fire underwriters. One standard compound duplex pumping engine with heater should be installed at first, with a capacity of 600 gallons per minute against a pressure of 125 pounds. Two boilers each of 75 h. p. should be set in boiler room. There are a few small towns where only one boiler was included in the original system, but I consider this too risky, as boilers must be cleaned occasionally, and may require repairs. There is less probability of a breakdown in the pump than in the boilers.

Reservoir.—There being no hill within the town or in the vicinity, it will be necessary to erect a standpipe or a tank upon a trestle, if storage be desired, in addition to that provided by the two railway tanks, each of which holds about 45,000 gallons. The elevation of the top of each tank is about 35 feet above the rail. The highest point in town is the "Battery" situated across the C. P. R. track opposite the west end of Birch Street. This rocky elevation is about twenty-five feet above the track and would afford a good site for a tank or tower. Unfortunately it cannot be connected with the proposed pipe system without excavating a rock trench.

A steel tank holding 45,000 gallons, on a steel trestle 30 feet high, would cost several times as much as a standard railway tank, and would, in your climate, require housing to protect it from frost. I am, therefore, inclined to recommend a wooden tub on a timber trestle, both tub and trestle to be surrounded by a wooden housing. Such a tank would give a good domestic pressure in town and at C. P. R. station for serving cars.

As a pressure of 60 pounds to 80 pounds is necessary at hydrants to give a good fire stream when the streams are flowing, the tank must be cut off from the system during fires, by closing a valve either by hand or by an electric trip from the pump house. The full pressure of the pump can then be given to the fire streams. When the pump closes down, the tower valve will open automatically, supplying the town as before.

Distribution System.—From the pump house an eight-inch force main is to be laid along the most economical route to Lisgar Street at Beech, with a branch to the proposed tank. I believe this route for the force main and the tank branch, to be preferable to laying it southwest of the rocky hill, upon which I propose to place the tank, to Ash Street; thence along Elgin or Monk (or the lane between them), to Elm; thence along Elm and across the C. P. R. tracks to Young Street. This latter route would be longer, would not give so good a fire service, and would cost no less.

I propose to utilize the existing C. P. R. four -inch cast iron main on Lisgar Street from Pine Street to Beech, and from the lane between Beech and Birch to the town hall.

I also propose that the small four-inch pipe to serve the houses west of the C. P. R. station be supplied from the C. P. R. main leading to their tanks.

The railway company may decide to take up the old four-inch pipe from the lane between Beech Street and Birch Street to their tank, but I believe that with the new pumping machinery it can be flushed out.

The plan shows the proposed pipe system, the sizes of the mains, the location of fire hydrants, etc. Changes may be made without affecting the general plan.

The total length of main is 8,000 lineal feet, with 18 fire hydrants.

I estimate that the works as designed and shown on plan will cost as follows:—

Intake, 600 feet of 10-inch	$2,500
Pump house	3,000
Duplex pumping engine	2,000
Two 75 h.p. boilers and stack	2,500
126 tons cast iron pipe, 18 hydrants, valves and specials	6,100
Labor of trenching and laying 9,000 feet of trenching	3,300
Extra for rock work	400
Elevated wooden tank	2,500
100 service pipes	1,500
Engineering and advertising	1,200
Total	$25,000

Cost of extras desirable:

Enlarging pump house for second pump	$600
Coal shed and tool house	500
Brick chimney	400
Extending intake 200 feet	600
Feed water heater and connections	400
Doubling capacity of tank	1,500
Engineering, etc., foregoing	200
Increasing sizes of mains and extending same	800
Total	$5,000

Revenue and operating.—Within two years you should have 100 consumers, and within five years 150 consumers. The revenue to be derived should average $5.00 from each service, or $2,250 per year within five years. The fire protection given by the water works system would effect a reduction in insurance rates of about $1,000 per year, which should be taken into consideration.

The operating expenses will probably be as follows: Salaries and wages $300 second year, and $400 fifth year; fuel, oil and repairs $1,000 second year, and $1,600 fifth year; total $1,300 second year, and $2,000 fifth year.

The revenue from domestic consumers should pay the running expenses from the first.

If the C. P. R. will take water from the town at a reasonable rate, your proposed water works system will be a paying investment for the town from the first.

Note.—This report, together with the plans submitted, were approved of by the Board, subject to the laboratory reports on the quality of the water being satisfactory.—C. A. H.

Report on Water Works and Sewerage Systems for the Town of Haileybury.

By CONNOR, CLARKE & MONDS, Consulting Engineers.

We beg to submit for your consideration the following report on a water works and sewerage system for the town of Haileybury.

Work was commenced on the survey on May 23rd, about one week after receiving notification that we had been retained to make the report. We wish to acknowledge the assistance given us by the members of the council as well as data on the soundings of Lake Temiskaming kindly furnished by Mr. La Flamme, the Government engineer.

Location.—The town is situated on Lake Temiskaming, and has an excellent deep water harbor. A line of steamers plies in the lake, connecting with the C. P. R. at Mattawa. Until a couple of years ago this was the only means of communication with the older parts of the country, but the town is now served by the Temiskaming and Northern Ontario Railway, which makes a junction with both C. P. R. and G. T. R. systems at North Bay, and will later effect a connection with the Grand Trunk Pacific about — miles north of Haileybury.

The town site slopes sharply from its westerly limits towards the lake, and the difference in elevation between the base of rail at the T. & N. O. Ry. station and the water level of the lake at low water is about 235 feet. The intersection of Main Street and Ferguson Avenue is about 60 feet above low water, and the intersection of Ferguson Avenue and Browning Street about 41 feet above low water.

Population.—The present permanent population is estimated to be 2,000, a very rapid growth having taken place during the past year. There are a number of excellent water powers within a radius of a few miles and the development of these assures a supply of very cheap power, and Haileybury, with its advantages of both lake and rail connections bids fair to be the leading commercial centre of Northern Ontario, consequently no system of municipal improvement should be adopted which does not make provision for a reasonably large increase in the population. Two plans of the town accompany this report—one showing a complete system of water works and sewers for the whole site as laid out, while the other indicates the system which we consider it is advisable to install at the present time. This is identical with the larger system as far as it goes.

WATER WORKS SYSTEM.

Water Consumption.—The amount of water supply required per capita per day varies greatly in different towns, but where no meters are used the consumption will average about 90 gallons per day for each individual, while with a complete system of meters this will be reduced to about 60 gallons per day. Hence, where the supply is a gravity system of limited capacity, or where pumping must be resorted to, it is always advisable to install meters in the house services

In towns, the size of mains is generally determined more from the capacity required for fire purposes than for domestic uses. For a town of 2,000 people, the fire underwriters require a system which shall be capable of supplying three full 1⅛-inch fire streams discharging at the rate of 200 imperial gallons each, or a total of 600 gallons per minute, while the maximum probable demand for domestic purposes with the same population would not exceed 200 gallons per minute. Furthermore the demand for fire purposes is concentrated near one point, while that for domestic purposes is spread over a large area, requiring but a small velocity in any except the main feeder. In a town such as Haileybury where the feeder from reservoir and pumps will be short and where each addition to the mains provides another circuit for the water, there should be absolutely no need for renewing any but a very short section of the feeders at pump house and reservoir, to supply a population of 12,000 people.

Assuming an average daily demand of 60 gallons per capita, the required supply with the present population would be 120,000 gallons per day.

A town of 5,000 people would require 300,000 gallons, and one of 10,000 people 600,000.

While the above are average supplies, the maximum demand during very hot and dry weather may reach double those quantities or 240,000 gallons, 600,000 gallons and 1,200,000 gallons respectively.

Sources of Supply.—The following sources were carefully examined.

(*a*) Gravity supplies:

(1) Lake Constance on the northeast corner of lot 8, in II concession, Township of Bucke.

(2) The Foster spring on southwest corner of lot 11, in IV concession of Bucke.

(3) A series of three springs along the face of the hill at the westerly limit of the town.

(*b*) Pumping supply:

(1) Lake Temiskaming.

Lake Constance stands at an elevation of 218 feet above the base of rail at T. & N. O. Ry. station, but the quantity of flow is so small and the quality of the water so objectionable that it may be dismissed without further consideration.

The Foster spring is at an elevation of 73 feet above the rail at T. & N. O. Ry. station, and the flow at the time of our survey was 135,000 imperial gallons per day. The water is very cold and agreeable to the taste.

Spring No. 2 is about 50 feet above the T. & N. O. rail and of rather small discharge.

Spring No. 3 is 44 feet above T. & N. O. rail, but so straggling in its nature that actual gauging of the flow is impossible till considerable work is done in developing.

Spring No. 4 stands at an elevation of about 62 feet above the rail, and on development will probably yield 100,000 gallons per day except in the dry season.

There is not much doubt that the four springs will have a combined flow of 275,000 gallons per day for at least nine months of the year, though with the clearing up of the country three miles west of the town, the tendency will no doubt be towards a decreased flow. Even at present, during very dry seasons a considerably decreased discharge may be expected. However, the cost of collecting the water is comparatively small, and the quality is so satisfactory, and the saving in cost of pumping so large that no doubt can remain as to the advantages of employing these springs as a source of supply.

The water from these springs passes through a bed of limestone, and is highly charged with salts of lime, rendering it quite hard and not well suited for laundry purposes.

While the quantity of water ordinarily available from the springs (275,000 gallons per day) is sufficient for the average consumption of a town of 4,500 inhabitants, the demands during dry seasons or for a large fire may far exceed the yield from the springs, and for this reason an additional supply must be provided, and this can only be secured by pumping from Lake Temiskaming.

Lake Temiskaming is a long narrow body of water which is in reality nothing but an expansion of the Ottawa River, consequently there is a considerable current to the south. The main channel lies just beyond the Government wharf, and at a point about 1,200 feet from the shore there is a depth of 40 feet at low water.

The only possible point of contamination for this supply lies in the sewage from New Liskeard, which will be discharged into Wabbi Creek, but there is no doubt that the Provincial Board of Health will insist on the treatment of this sewage, so that it will be rendered harmless. Moreover sewage is always warmer than the surrounding water and tends to remain near the surface. It is therefore practically certain that an intake in 40 feet of water would receive none of this effluent. This has been the experience in Toronto, which is very similarly situated with regard to its water supply.

System.—The system recommended as shown on the accompanying plans is then a combination of a gravity and a pumping supply, the latter to be used only in cases of fire or when the demand shall exceed the flow from the springs. As the same mains are used in either case, no additional cost is entailed in securing the combination of the two systems.

Analysis.—The following analysis of the water from the different sources mentioned was made by the Provincial Analyst, and shows that at present all are on an equal footing as regards freedom from evidences of pollution.

Where collected from.	Streptococci.	Staphylococci.	Colon Bacilli.	Colonoid Bacilli.	Chlorine. Per Million.
Spring No. 1	—	—	—	—	5
Spring No. 2	—	—	—	—	4
Spring No. 3	—	—	—	—	5
Spring No. 4	—	—	—	—	4
Lake Temiskaming	—	—	—	—	4

Reservoir.—For either a gravity or a pumping system it is usually necessary to provide a reserve supply in a tank or masonry reservoir, which may be drawn upon when the demand exceeds for a brief period, the capacity of the springs, or when the pump is shut down. In the system presented herewith the water is conducted by gravity from the different springs to a masonry reservoir on the face of the hill at the west side of the town. This reservoir is then connected by a main to the distribution system, and through this distribution system to the pump at the lake. It thus forms a storage for the water from the springs or from the pump as the case may be.

The pressure given by the reservoir may be too small for fire purposes in certain parts of the town, in which case it will be necessary to close the valve at the reservoir and pump to the mains only. It may also be necessary in the future to provide an elevated tank supplied by the pump, to give even a domestic supply to certain portions of the western section of the town which are at or near the same elevation as the reservoir.

The capacity of the reservoir should be as large as possible, but for the present we have placed this at 225,000 gallons, which is larger than that provided in most towns of similar size, which depend on a pumping supply only. Extensions can be made at any time required.

It is now considered important to cover reservoirs both to prevent contamination and to exclude the light, thus preventing the formation of vegetable growths, also the protection thus afforded from the sun keeps the water cool.

Our estimate is for a reinforced concrete reservoir with roof of the same material, size about 60 feet square and 12 deep, provided with manhole and overflow. Considerable rock excavation will be necessary on the site of the reservoir.

Developing Springs.—The springs should be thoroughly cleaned and a chamber blasted out at each place; they will then be protected by concrete coverings. The water will be led by gravity through tile pipes to the reservoir. About one acre of ground should be secured around each spring and fenced. The whole supply from these sources will then be thoroughly protected from contamination.

Pumping Station.—The development of water powers in the near future assures cheap electric power. For this reason, as well as the fact that an electric driven pump can be put in operation at a moment's notice, an improved turbine pump direct connected to a motor is recommended. This pump will have a capacity of 625 imperial gallons per minute against a pressure of 150 pounds at the pump, and will be capable of discharging three or four full fire streams, depending on the elevation of the hydrant in use with reference to the lake level.

Provision will be made in the pump house and piping for the addition of another pump in the future should the growth of the town demand it.

As already stated the pump will also be used for supplementing the flow of the springs if this is found necessary by pumping into the same mains as that fed by the reservoir, thus necessitating no additional piping.

The turbine pump recommended is not quite so efficient as one of the reciprocating type but is much cheaper, more serviceable, and has less liability of getting out of order. Hence for occasional service, it is much the better type to install.

Pressures.—The static pressure obtained at some of the principal points in the town due to the head given by the water contained in the reservoir is as follows:—

	Pounds.
Rail at T. & N. O. Station	18
On Main Street opposite Mayor Farr's house	56
On Main Street opposite Haileyburian office	69
At corner Main Street and Ferguson Avenue	73
At floor line of Matabanick Hotel	81
At corner Main Street and Lake Shore Road	93
At corner Ferguson Avenue and Browning Street	81

With the reservoir shut off and the pump maintaining a pressure of 150 pounds the pressure obtained at these points is as follows:—

	Pounds.
At the reservoir	60
At rail at T. & N. O. station	75
On Main Street opposite Mayor Farr's house	113
On Main Street opposite Haileyburian office	124
At corner Main Street and Ferguson Avenue	129
At floor line in Matabanick Hotel	137
At corner Main Street and Lake Shore Road	146
At corner Ferguson Avenue and Browning Street	137

Mains.—The size of the mains is dependent on the quantity required for fire in addition to domestic purposes. The system as shown on the accompanying plan is as far as possible of the closed circuit type. That is any hydrant is served by water flowing from at least two directions. This has the two-fold advantage of permitting the use of smaller pipes and preventing the accumulation of stagnant water in pipes which are little used. The main leading from the pump to reservoir is the distributor to the north and south ends of the town, and is of sufficient size to take care of fires occurring simultaneously on both sides of this main. Hydrants are placed at street intersections or intermediate points where necessary. The cost of 50 feet of hose is greater than the price of a hydrant, and it is a great mistake to have too few of these, as the hose deteriorates much more rapidly, and the friction loss in it is very great compared with that in the cast iron pipe. Gate valves are placed as far as possible, so that any street may be shut off without interrupting the service in other parts of the town. The mains should have an average covering of 5½ feet over the top of the pipe. The intake pipe for the pumping supply will run about 1,250 feet into the lake, where it will lie at a depth of 40 feet at low water. A suitable strainer will be attached to the end of the pipe to prevent the entry of weeds and other matter.

ESTIMATE OF COST OF WATER WORKS SYSTEM.

Protection and development of spring	$1,400
Piping springs to reservoir	4,300
Mains and hydrants	35,000
Reservoir	4,500
Machinery, pump house and well	5,100
Intake pipe	6,300
	$56,600
Add ten per cent. for engineering and contingencies	5,600
Total	$62,200

The additional cost of meters and services will be about $25.00 each.
No allowance has been made for purchase of land or rights-of-way.

ANNUAL CHARGES.

We estimate the annual charges to be as follows:—

Interest on investment at 4 per cent	$2,488
Sinking fund at 1¼ per cent.	780
Maintenance and repairs	200
Cost of power	500
Wages for operating	200
Superintendent	800
Total	$3,968

Revenue.—When there are 200 services installed the revenue at the rate of $10.00 per service will amount to $2,000.00, thus more than meeting the operating expenses, which are estimated at $1,700.00 per annum. An allowance of $45.00 per hydrant should also be made as the value for fire protection. The total revenue will therefore be slightly in excess of the annual charges.

Sewerage System.—With the introduction of a water supply comes the problem of disposing of the waste from the same. This must be met by installation of a sewerage system.

While the range of elevations in a town make no difference to the flow in the water works pipes, which are always under pressure, it is altogether different with a system of sewers in which it is necessary that the water may pass away without totally filling the pipes, often necessitating deep cuttings in order that the sewer may be laid to a grade. Haileybury is very fortunate in this respect, as in practically every instance the sewers can be laid at a minimum depth, and furthermore the grades are so steep that very small pipes may be used.

In the section of the town south of Browning Street, all the lots face toward the streets running east and west, while in the section north of this most of the lots face towards the streets running north and south. This will account for the different direction of the sewers in the two sections of the town, as shown on the plan.

In general there are two systems of sewerage in common use known as the combined and the separate. In the former both domestic sewage and storm water are carried in the same pipes, while in the latter the domestic sewage is carried in one set of pipes and the storm water in another, or quite often allowed to seek the natural water courses.

The advantages of the separate system may be briefly summed as follows:—

Since the maximum storm water to be carried may amount to 30 times the sewage discharge from the same area, the depth of the stream in the sewers of the combined system during a dry season is much too shallow to secure a proper cleansing. Consequently these sewers are usually very foul, while with the separate system the sanitary pipes are always flowing about half full and are comparatively clean.

Again should it ever be necessary to treat the sewage before allowing it to flow into the lake, it will be absolutely necessary to keep the domestic sewage separate from the storm water on account of the extra cost of treating an unnecessarily large flow.

The cost of the separate system is nearly always much lower than that of the combined, owing to the smaller sizes of pipes used, and to the fact that much of the storm water need not be handled in a pipe system, but allowed to find its way to the natural water courses.

Sanitary Sewers.—The general scheme of the sewerage system shown on our plans consists in an intercepting sewer of the required size placed along the lake front to receive the discharge from the feeders on each street. The lowest elevation in this sewer is at a point about 500 feet north of Elliot Street, and here the sewage from both directions is discharged into a chamber from which it flows in a cast iron outlet to a point in the lake about 800 feet from shore into a depth of ten feet of water at low level. The contour of the lake at this point is such that no back eddies will occur on the Ontario side, so that the sweep of the current will then carry the sewage to the south without danger of polluting the water works intake, nearly half a mile distant upstream.

In order to avoid a deep cutting at the Vendome Hotel, the main intercepting sewer from the north must leave the Lake Shore Road and pass close to the lake, through private property to the foot of Browning Street. We understand that the T. & N. O. Railway intend building a siding to the wharf, which will practically parallel this line, and we would therefore recommend that an effort be made to secure the privilege of laying this sewer on their right-of-way. Other private land must be crossed both north and south of this, but practically no damage will result to the property.

Quantity of Sewage.—The quantity of sewage will approximate the water supply, as leakage from ground water will about make up for the quantity used in sprinkling lawns, etc.

Owing to the small area to be served by each branch sewer and the steep grade obtainable, we find that none of these branches requires a larger pipe than eight-inch diameter, while on the other hand this has been found by experience to be the minimum size which it is advisable to install in a sewerage system. The main intercepting sewer varies from 10-inch to 15-inch diameter, and is necessarily laid throughout with a very flat grade. At the outlet chamber it will be only about three feet above the high water mark in the lake.

Storm Sewers.—Storm sewers should be constructed, as shown on the plan, on portions of the following streets:—Main, Broadway, Browning and Ferguson Avenue, discharging down Browning to the lake, just north of the wharf. We believe that the corporation is scarcely justified in going to the expense of taking care of the storm water in other portions of the town except by necessary culverts at street intersections.

Most of the excavation for both water works and sewerage pipes will be in a rather tough clay, but along the lake front considerable rock will be met, especially in the southeastern part of the town. As a general thing we would recommend that where rock excavation is required the sewerage and water works pipe be laid in the same trench, to reduce the expense.

For various reasons it is not generally practicable to follow this line of construction in earth trenches.

In the event of the Provincial Board of Health insisting on treatment of the sewage before discharge into the lake it will be necessary to install a small pumping station at the junction of the trunk sewers at the point of outfall shown on the plan, and to pump the sewage from this point southerly along the Lake Shore Road, where it will discharge into a septic tank placed some distance south of Lawlor Street. From the tank it would discharge into the lake by gravity, or, if in the future complete purification is necessary, on to filtration beds and from them into the lake. The septic tank will remove about fifty per cent. of the solids in suspension and thirty per cent. in solution, and will in addition exert a purifying effect on the effluent. It will probably be necessary to secure a few acres of land for the disposal works.

ESTIMATES OF COST OF SEWERAGE SYSTEM.

Trunk sewer and sewers opposite exempt property and street intersections	$14,000
Outfall sewer	3,700
Storm sewers	5,100
Sanitary sewers opposite assessable frontage	21,200
	$44,000
Add ten per cent. for engineering and contingencies	4,400
	$48,400

Of this amount the cost of the trunk sewer, outfall sewer, sewers opposite exempt property, storm sewers and half the engineering expenses, or a total of $25,000 should be borne by the town, and the remainder $23,400 should be assessed upon abutting property.

In the event of the Provincial Board of Health insisting on treatment of the sewage the additional cost will be as follows:—

Septic tank	$3,500
Piping	4,600
Collecting well and house	1,100
Pumps	1,100
	$10,300
Add for engineering and contingencies	1,000
Total	$11,300

No allowance has been made for purchase of necessary land and rights-of-way.

Payments.—We recommend the uniform-frontage-rate system of payment. It is manifestly unfair that expensive parts of the installation which are yet necessary to other parts of the system should have their cost borne by the owners of property abutting them. A uniform frontage rate should therefore be levied as the sewers are installed. The town should bear the cost of the trunk sewer, storm sewers, the disposal works, the outfall, and the sewers opposite exempt property, and the remainder should be levied as a local improvement tax amounting in general cases to about one-half the total cost.

We would recommend for Haileybury a uniform frontage rate of sixty cents per lineal foot, or an annual tax of about four cents per lineal foot for thirty years, to be collected only after sewers are laid.

Construction.—The sewers should be laid at the same time as the water works piping. Closer prices can be obtained for the larger quantity of work, and streets are opened only once.

Supplementary Report on Sewerage System for the Town of Haileybury.

By CONNOR, CLARKE & MONDS, Consulting Engineers.

We have been informed by Dr. Hodgetts, Secretary of the Provincial Board of Health, that the Board insists on partial purification of the sewage before discharge into the lake.

In our original report, we made an estimate of the additional cost of the system in case purification should be insisted upon—the estimate amounting to $11,300.00. This estimate was based upon the septic tank being placed at the southern limits of the town, and provision was made for the necessary pumps, piping, etc., in order that for complete purification, all that would be necessary would be to obtain filtration beds for the effluent, from the septic tank. It is the opinion of the Board, however, that complete purification will be unnecessary for many years to come, and we therefore recommend that the septic tank be placed as shown on the revised drawing. In the future, if complete purification is found to be necessary, a storage tank can be built along side the septic tank, and the necessary pumps and piping installed to deliver the sewage to the filtration beds.

With the septic tank placed as shown on revised plan, we estimate that the additional cost for septic tank will be $5,000.00 instead of $11,300.00, making a total of $53,400.00 for the complete sewerage system, with provision for partial purification of the sewage.

Conditions of Board in respect to Plans of Haileybury.

TORONTO, July 23rd, 1906.

DEAR SIRS,—Your supplementary report on the sewerage system of the Town of Haileybury, together with the amended plan, was duly laid before the Board at a special meeting held Wednesday, July 18th.

I beg to inform you that the sewerage system was approved of, with the understanding that the septic tank as shown in revised plan, be constructed and operated from the inception of the plant; and that under no conditions must raw sewage be permitted to empty into Lake Temiskaming—and also that when the Board requires it, the municipality shall make provision for subsequent treatment of the effluent. And further, the municipality must adopt a code of plumbing by-laws and provide for the efficient carrying out of the same, a copy of said by-laws to be filed in this office.

For the information of the municipality of Haileybury, I am sending them a copy of this letter.

Yours truly,
CHAS. A. HODGETTS, M.D.,
Secretary,
Chief Health Officer of Ontario.

Messrs. CONNOR, CLARKE & MONDS,
Consulting Engineers,
Toronto, Ont.

Note.—The report and plans as amended by supplementary report dated July 12th, 1906, were approved of by the Board.

C. A. H.

The King *v.* George Stroud *re* Feeding of Raw Offal to Hogs.

The accompanying certificate and order of the Honourable Mr. Justice Anglin will, it is to be hoped, settle forever the question as to the illegality of feeding raw offal to hogs. It need hardly be stated that no doubt has existed in the mind of sanitarians as to the undesirableness of the disgusting practice which from the evidence given in the case referred to would evince a laxity on the part of local sanitary authorities to enforce the health act.

It is to be hoped this ruling of the High Court will stimulate local health authorities to enforce the law as regards the feeding of improper food to hogs.

Owing to the fact of the M.H.O. of the City of Hamilton failing to secure a conviction in this case although the charges were substantially admitted, the Attorney-General upon his attention being drawn to the facts by the Chief Health Officer of Ontario, at once submitted the case in the manner indicated and the Magistrate ordered to render a conviction against the defendant, George Stroud.

In the High Court of Justice.

The Honourable
Mr. Justice Anglin
In Chambers.

Friday, the twenty-sixth day of October, A.D. 1906.

The King
v.
George Stroud.

To the Police Magistrate of the City of Hamilton:

Whereas on the 11th day of September, 1906, George Stroud was charged before His Worship Frederick Jelfs, Police Magistrate for the City of Hamilton, for that he did unlawfully feed to hogs on his premises in the City of Hamilton, the blood and offal of a dead animal, which had not been previously boiled or steamed when fresh, contrary to the provisions of "The Public Health Act." (Section 108, sub-section 8);

And whereas it was proved and admitted that the blood and offal fed to the hogs were fresh and had been taken from a cow that had been recently slaughtered, and that such blood and offal had not been previously boiled or steamed;

And whereas the said Police Magistrate of the said City of Hamilton having refused to make a conviction upon request of the Crown, did in pursuance of section 900 of The Criminal Code, 1892, state and transmit in a case signed by him reserved for the consideration of one of the Justices of the High Court for Ontario the following questions:—

(1) Is it an offence against the said statute to feed the blood and offal of an animal that had been recently slaughtered to hogs, which blood and offal had not been previously boiled or steamed when fresh?

(2) Do the words "dead animal" contained in sub-section 8 of section 108 of "The Public Health Act" include a cow that had been previously slaughtered?

(3) Do the words "dead animal" mean an animal which has died from natural causes, or a diseased animal that had died?

(4) Can the blood and offal of an animal that has died from natural causes, or from an animal that was diseased and had died be fed to hogs, even if such blood and offal had been previously boiled or steamed?

Now, I, the Honourable Francis A. Anglin, one of the Justices of the High Court of Justice for Ontario, pursuant to the provisions of Criminal Code, 1892, in that behalf

Do hereby certify that having heard and considered the said questions and what was alleged by Counsel for the Crown and for the said George Stroud respectively,

I have ordered and adjudged and finally determined, and I do hereby order and adjudge and finally determine as follows: —

That questions one and two should be answered in the affirmative.

That to question three the answer should be, no.

That question four should be answered in the negative.

And it is further ordered that the said Police Magistrate do enter a conviction in accordance herewith.

In witness whereof, I have hereunto set my hand at Toronto aforesaid this day of November, A.D. 1906.

(Sdg.)

Regulations for the Sanitary Control of Lumber, Mining and other Camps, Sawmills, and other Industries situated in the Unorganized Districts.

Approved of by His Honour the Lieutenant-Governor-in-Council September 7th, 1906.

Employers to notify Provincial Board of establishment of each Camp forthwith and annually.

(1). Every employer of labor on any work in any lumbering, mining, contruction or other camp, sawmill and other industry situate in any portion of the unorganized districts without municipal organization shall upon the establishment of each and every camp and work forthwith notify the Provincial Board of Health of the establishment of the same, and annually thereafter upon a date fixed by the said Board, giving particulars as may be required by the said **Board.**

All Employers to Contract with Physicians for Supervision of Camp and Monthly Inspection of same.

2. Every employer of labor on any such work shall contract with a duly qualified physician for the sanitary supervision of camps, dwellings or works, and such physicians shall inspect the same at least once a month or oftener if in the opinion of the Chief Health Officer the health conditions of the Province require it, and shall forthwith report in writing to the Provincial Board of Health, the first report, however, to be accompanied by a sketch or plan of each camp showing the location of the various buildings, with distances apart, location of water supply, slopes of ground with drainage, and such other information as may be required by the Provincial Board of Health.

Employers (except Lumbermen) to Contract with Physicians for Medical and Surgical care of Employees. They may deduct from wages a sum not exceeding $1.00 per month.

3. Every employer of labor on any work other than a lumber camp shall contract with one or more *duly qualified physicians* for the medical and surgical care of his employees; and may deduct from the pay due any employee a sum not exceeding $1.00 per month, which shall be paid to the physician or physicians so contracted with, and every such *physician* shall supply medical attendance and medicine to the employees.

Lumbermen have option of employing Physicians, but in lieu thereof assume certain responsibilities.

4. Every employer of labor in a lumber camp may contract with one or more *duly qualified physicians* in the manner hereinbefore provided, and in that case may proceed in the manner authorized by the said regulations, and every physician so contracted with shall possess the powers and perform the duties set out in the next preceding regulation; but every such employer who does not contract for the medical attendance of his employees shall be responsible for the medical care and maintenance of each and every employee taken ill while in his employ, and shall incur a like responsibility for each and every case of sickness which develops after quitting his service or after being discharged from his employ, when, in the opinion of the Provincial

Board of Health, the origin of such sickness is traceable to the period of such employment, or to an accident occurring while in such employ, when the sick or injured person is not able to pay or does not pay for the same—the apportionment and adjustment of the payment of expenses so incurred to be determined according to section 3, chap. 34, I Ed. VII.

Copy of Contract to be furnished Provincial Board which for reasons may require changes in manner herein set forth.

5. Employers of labor on all works in the unorganized districts without municipal organization shall transmit, at the time of the making of the contract, a copy of the same to the Secretary of the Provincial Board of Health, and of any subsequent change made in their physicians and of the contracts between the two contracting parties. Should it appear to the Provincial Board of Health, owing to the distance of the residence of the physician employed from the camps of the company, that the best interests of the employees are not likely to be served, it shall be competent for the said Provincial Board of Health with the approval of the Minister of the Department, to require any employer of labor in such districts to contract with some physician residing at or near the works of the company. Should it further at any time appear, owing to the distance of the physician from the camps or to neglect or other cause on the part of the company or physician employed, that an employee has been put to expense to secure the medical assistance for sickness or accident other than of employer's physician, the employer and physician shall be held responsible for the payment of a reasonable fee for medical services, the amount to be paid in such instances to be determined in case of dispute by the Minister of the Department, under sec-III of the Act, chap. 34, 1 Edward VII.

Owner, Manager, etc., responsible for carrying out of Regulations and Health Act.

6. The owner, manager, agent or foreman of any lumbering camp, mining camp, sawmill, smelting works or other industry, or of any railway construction camp located in any portion of the unorganized districts without municipal organization, shall in connection with every such industry or works be responsible for the execution and enforcement of any regulation herein contained, or of any clause of any Health Act governing in any case or circumstance.

The same measures taken by Local Health Authorities to be adopted by Employers, Agents, etc., in the case of Communicable Diseases.

7. Every measure required to be taken by a local Board of Health or or any Medical Health Officer, sanitary inspector or other health officer under the Public Health Act, or any regulation made thereunder in any unorganized municipality must be at once taken by the employer and his employees or agents, or the physician employed by the same, whenever any suspected communicable disease referred to in the said Public Health Act or Regulations breaks out in any camp, works, or dwelling to which these regulations apply, and the said employer, manager, foreman, agent or physician employed shall be subject to the same penalties as any of the aforesaid health officers.

Provincial Board to be notified forthwith of each and every case of Communicable Disease.

8. Should any suspected communicable disease as defined under the Public Health Act break out in any camp, works or dwelling, the employer or his employee or agent in charge of the camp, works or dwelling, shall immediately send notice to the physician employed, who shall at once notify the Secretary of the Provincial Board of Health of the outbreak. In all respects the employer, his employee or agent in charge of any camp, works or dwelling shall be held in the same position as regards the occurrence of contagious diseases therein as a householder and shall conform to sections 86, 87, 88 and such other sections of the Public Health Act and Regulations as may relate to the duties of the householder.

Employees in Camps to furnish Certificate of Vaccination upon request of Provincial Officer.

9. Every employee in any lumbering camp, mining camp or other industry on which men are employed shall, when requested by the secretary or officer of the Provincial Board of Health, furnish the foreman or other person in charge of the same with a certificate of successful vaccination or re-vaccination within the immediate preceding five years, and the secretary or officer of the said Board shall forthwith quarantine any such camps or works until such certificate has been furnished by each and every employee in the said camp, works or industry.

Two Classes of Hospitals must be provided by all Employers.

10. In connection with every camp, works or dwelling coming under these regulations there shall be constructed a building, or in lieu thereof a double-walled tent or tents shall be kept on hand with floor or floors and with facilities for heating and ventilation, for the reception of any employee who may become sick. Such building or tent to be approved by the Inspector of the Provincial Board of Health. Should any disease of a contagious nature, as defined by the Public Health Act, break out, a separate and distinct isolation hospital, building or tent, provided by the owner shall be located by the physician in charge of the patient in a position satisfactory to the Inspector of the Provincial Board of Health.

Site of Camp, Buildings, etc., to be approved by Inspector.

11. The location of the buildings of any camp or works shall be made with a due regard to its healthfulness, and any new camp or works located without the previous approval of the Inspector of the Provincial Board of Health must be moved to a proper location, if afterwards the site is found to be undrained, unhealthy, or wanting in any adequate or wholesome water supply; and old camp, works or dwelling, if proved unsanitary or unhealthful, shall have instituted such drainage or have introduced such a water supply as is satisfactory to the aforesaid Inspector.

Provision as to Air Space, Lighting, Etc.

12. Any house, tent or dwelling occupied by the employees engaged in any industry in any territory without municipal organization, shall contain sufficient cubic feet of air space for every occupant thereof as may in each instance be deemed necessary by the Provincial Board of Health, and shall

further be provided with efficient means of ventilation. The floor of every dwelling shall be constructed of boards or planks, or other material equally suitable for the purpose, raised on supports at least one foot from the ground, and so made that it shall be tight. Every such dwelling, other than a temporary tent, not exceeding 10 feet by 15 feet, shall be supplied with adequate lighting; and in all wooden or iron structures the windows must be constructed that they can be opened when necessary.

Method of Ventilation to be Approved.

13. The method of ventilation of every dwelling in which a stove or furnace is used, shall be such as will satisfy the Inspector of the Provincial Board of Health. The temperature of the room should be maintained at from 60 degrees to 65 degrees Fah. and a shallow pan supplied with water, shall be kept on the stove to supply air moisture.

Wash-House, Laundry, and Bath.

14 Every camp of the works of any industry coming under these regulations shall be equipped with a separate building to be used as a wash-house or laundry, and attached thereto a room, or if preferred, a separate building or tent equipped with a stove and tubs for bath purposes, in a manner satisfactory to the Inspector of the Provincial Board of Health.

Separate Kitchen with Dining Room to be provided.

15. Every camp, or works shall be supplied with a building or tent properly constructed and set apart as a kitchen or cook-house, and having a dining-room or eating-room in connection therewith, with proper conveniences for the cleanliness and comfort of the employees, and must be satisfactory to the Inspector of the Provincial Board of Health.

Refuse to be collected and removed in buckets.

16. Proper buckets should always be kept on hand, into which all refuse, whether liquid or solid, can be placed, and the refuse must regularly be removed to a safe distance from the kitchen, and be so deposited as not to create a nuisance or contaminate the drinking water. A properly constructed drainage system satisfactory to the aforesaid Inspector may be utilized in lieu of slop buckets.

Latrines or Earth Closets to be kept clean.

17. Latrines, earth or other closets located to the satisfaction of the physician employed and to the Inspector of the Provincial Board of Health, shall be constructed at every camp or works, and must be located and maintained in a sanitary condition satisfactory to the Medical Officer of the works, and to the aforesaid Inspector.

Stables to be not less than 125 feet distant from Kitchen, Etc.

18. The stables in connection with any works or camp, must be so located as not to contaminate the water supply; and must not be less than 125 feet distant from any dwelling or kitchen. In large camps this distance may be increased, if thought necessary, by the aforesaid Inspector.

Printed Copies of Regulations to be furnished by Board and kept on file in Office.

19. Printed copies of these regulations shall be furnished every employer of labor upon notifying the Secretary of the Provincial Board of Health as required under Section 1 of these regulations, and a copy shall be kept on file in the office of each clerk of the works for the use of employees if so desired.

Board may enforce Regulations at expense of Employer.

20. Should the Provincial Board of Health, on complaint or otherwise, find that any of these regulations are not complied with, the Board or its inspector, shall, when necessary, take steps to enforce these regulations; and the expense of such inspection shall be paid by the employer or his agent responsible for the violation of the regulations, as provided under section 3 of the Act, 1 Edward VII, chap. 34.

Penalties same as Sec. 72 of the Health Act.

21. The penalties contained in section 72 of the Public Health Act against illegal carrying on of any industry mentioned therein, shall apply to the violation of any regulation herein made with regard to the proper location, construction and equipment of the camps, works or dwellings under these regulations.

Quarterly Report of the Secretary.

CHAS. A. HODGETTS, M.D.

Presented at the Meeting of the Board, held November 14th, 15th and 16th, 1906.

It is my pleasing duty to welcome you as members of the Board and express the wish that our association may be as pleasant and profitable as that it was my pleasure to hold with my former colleagues whose term of office expired last August.

Coincident with the expiration of the term of the former Board was the completion of a quarter of a century of health work in this Province, and it was the unique fortune of one of the members of that Board, Dr. J. J. Cassidy, to have sat continuously thereon for the twenty-five years during three years of which he had the honour of being its Chairman, and another member, Dr. Oldright, has, with the exception of some two years likewise been identified with the Board during the same period, while the retirement of my predecessor, Dr. P. H. Bryce, some two and a half years ago from the office of Secretary and permanent member, removed from the active field of health work in Ontario one of the remaining pioneers. To the honest endeavors and faithful work of these sanitarians and those who since the inception of health work in our Province have been associated with them upon this Board, many of them have already passed over to the great majority—to these men is largely due the credit of the present high standard which it is acknowledged by others that Ontario occupies not only in this Dominion but on this continent.

This is all the more surprising when we find the total expenditure under legislative grants made during the quarter of a century for carrying on the work was less than $250,000, and further it must be remembered the Public Health Act itself is more or less emasculated in character, the powers of local boards, medical health officers and the Provincial Board having been denuded of the mandatory character often so essential for a successful enforcement of sanitary measures, hence changes have often been brought about solely by persuasive or educational means, which must always be slow, tedious, unsatisfactory and expensive where human life and health are concerned.

An analysis of the figures referred to above shows that the total amount expended by the Province for health purposes during the past twenty-five years has been $291,086.48, which sum includes $49,270.71 spent to control smallpox, making the net amount expended for the ordinary routine work of the Board $241,815.77, being an average of $9,672.63 per annum; the year of minimum expenditure, with the exception of 1882, when the only amount charged against the Provincial Board of Health was $300.00 for smallpox at Rat Portage, was 1887, the sum being $7,413.13: the maximum being reached in 1905, when $15,076.60 was expended. This nearly doubling of the expenditures has been due to the growth of the laboratory work and the increasing of the office staff by a medical inspector, and not by reason of any increased expenditure in the way of publication and distribution of sanitary literature or work of an educational character.

Board of Health Expenditure, including Government Grants for Smallpox and other Outbreaks.

Year	Place	—	Total
1882	Rat Portage (*a*)	$ 300 00	$ 300 00
1883			8,716 29
1884			8,333 17
1885	Hungerford (*b*)	3,437 23	10,871 40
1886	Montreal (*c*)	6,430 05	13,843 18
1887	" (*d*)	1,984 50	9,399 83
1888			7,852 12
1889			8,761 99
1890			7,987 60
1891			9,950 83
1892			9,431 68
1893			10,699 53
1894	Fort William (*e*)	1,063 44	10,468 53
1895			10,288 32
1896			9,493 52
1897			8,799 61
1898			10,192 78
1899		280 00	10,160 76
1900			9,973 67
1901	Sudbury District (*f*)	22,383 89	32,587 03
1902		5,733 78	20,113 34
1903		1,907 17	16,259 55
1904		4,573 60	17,623 55
1905		1,084 50	16,160 10
1906	(Nine months)	92 55	12,733 10
		$49,270 71	$291,086 48

(*a*) Smallpox. (*c*) Smallpox. (*e*) Smallpox.
(*b*) Smallpox. (*d*) Vaccine expense acc. (*f*) Smallpox.

Last grant to vaccine farm was in 1900 ($250.00).

In assuming the charge under the Minister of the Crown of the Public Health of Ontario, you will find a laboratory which in both chemical and bacteriological branches is in a satisfactory state of equipment and which with a slight addition to the personel of the staff would give the highest class of work possible. The office staff is able at present to keep up to the increased volume of work, but the same cannot be said of the medical duties, our esteemed Inspector has too much ground to cover and this branch of our work must receive your earliest attention, and at the same time I cannot too strongly urge upon your consideration, as I have done in previous reports, the need of an addition to the staff of a sanitary engineer, whose duty it would be to supervise the reports and plans on sewerage and water systems as they relate to his particular branch of the work, and further he would be able to render valuable assistance in the annual inspection of all public and private systems approved by the Board.

Looking to the future, I would direct your attention to fields that are open in public health work, which deserve your earnest consideration, and after you have arrived at definite decisions thereon should be placed before the Honourable the Provincial Secretary for his approval.

The list is a long one, as follows:

(1) An amended Health Act.

(2) A consideration of the laws relating to milk and dairies, and the drafting of a bill to deal with the question and regulations applicable to the different classes of municipalities.

(3) Also similar consideration of the question af abattoirs, slaughter houses and meat supplies.

(4) The drafting of a plan looking to a hygienic educational crusade throughout the Province in which could be included the tuberculous exhibit, an order for which has been placed with the approval of the Honourable the Provincial Secretary.

(5) The desirability of making some change in the present law as to the manner in which the Public Health Act and regulations of this Board are administered in the smaller cities and towns, whereby local boards and medical health officers would be abolished, and some system of a more independent central administrative body be established in counties or districts with a M.H.O. who would be specially qualified and who would devote his time to the work and perform laboratory duties for the districts over which he had jurisdiction.

(6) A resetting of the vaccination laws with the object of making them more positive, efficient and practicable both as regards primary and secondary vaccinations, together with a consideration of the duty of the state in making adequate provision for the producing of a guaranteed vaccine, as also of providing an antitoxin for the treatment of diphtheria, in lieu of leaving the manufacturing of both these biologic products in the hands of private individuals.

(7) A reconstruction of many of the older regulations of the Board together with the model plumbing by-law.

At the charge of being a little tedious I desire to refer at length to some of these desirable changes.

Revision of Health Laws and New Legislation.

I need hardly refer to the necessity which exists for a consolidation and revision of the Public Health Act and several regulations of the Board which have been passed at different times during the past quarter of a century.

In many points the law as it now stands is found to be inoperative either from the vagueness in the wording of many of its clauses; the failure to make many of them imperative upon local health authorities, in the changed conditions which now exist in many of our large cities as compared with rural municipalities whereby provisions are often ineffective through the effort to deal with generalities.

For these and many other similar reasons, I submit for your consideration the draft of a new Health Act as drawn up and approved by your predecessors in office at considerable trouble, and which will very materially assist this Board in a consideration of this most important question. One of the most important changes that should receive careful study is the reorganization of the present methods of administration of the Health Act by means of local Boards of Health and Medical Health Officers, who are engaged in general practice, services for which they often receive no remuneration, and who if they enforce the simplest of the health laws get only abuse from the public who begrudge them even the assistance which it is presupposed they already have. So patent has it become that many local authorities will not expend the necessary money for this health service, that the need for newer and up-to-date methods are imperative if the growing difficulties in health matters are to be met. Some change in the direction of the abolition of local Boards of Health in the smaller cities, the towns and townships and the substitution therefor of a central county or district health authority with a qualified M.H.O., who will devote all his time to the work will perhaps, solve the problem. This will entail some expense, but is not the important matter of public health deserving of financial aid from the public, and such an officer might perform in addition to those duties specially relating to Public Health—the enforcement of the Act respecting Contagious Diseases in Animals—a direction of the sanitary measures to be adopted by cheese factories and creameries—a medical inspection of the school children. Such a district officer could perform post mortems and act as a referee in insanity cases.

In those cities where paid M.H.O.'s are now employed by the municipal authorities we find the most efficient administration of the present laws—and these municipalities often suffer financially by reason of the fact that the health authorities of adjoining municipalities thrust their cases of contagious diseases upon them, and this is very fully exemplified in the inertia of the rural authorities in the matter of dairies and milk supplied to the urban residents. My own experience is that the members of rural Boards of Health expect a M.H.O. to work for nothing, and while they themselves will not shoulder the responsibilities assumed when taking office, too often they draw a per diem for attendance at the board meetings at which they do nothing. As an example I quote the following extracts taken from letters which have recently reached me:

"The Board further say that if I am called upon to do anything I must "collect from the people for whom I am called. I maintain that as the "Council appoints me they must collect or see that I am paid. I was in-"formed yesterday by Dr. S——, of W——, that there is an epidemic of "typhoid over at S——; five or more families have it who have nearly all "been drinking from the same water. I cannot go over and get a sample of "the water or ascertain the correctness of the report at my own expense, and "the Council or Board will not pay me or see that I am paid, so there is "nothing done."

A Crusade of Popular Education.

The many difficulties referred to in this report, as well as many others known to exist, clearly indicate one thing, and that is the ignorance of the public in many essentials which relate to personal hygiene and public health. This can hardly be wondered at, for beginning with the public school system and continuing throughout the various higher branches of education, and extending into later private life, little or nothing has been done to place before the public either in word or book the necessary knowledge.

I would not be misunderstood—the public have a general idea of what is meant by rules, or, laws of health, but I find in many cases, for instance that of consumption—the little knowledge they possess, the few disconnected facts have made them paniky. An example of a little knowledge is dangerous. There are facts relating to personal hygiene and public health which can and should be presented to all, and this Board should be given the funds and the power to do this important educational work, and I believe the public so appreciate the necessity, and would heartily endorse such expenditure upon a properly organized system.

The ground includes schools, public and private colleges, and public assemblies of all kinds; in the latter the instruction should extend to an explanation of the duties of citizenship in the observing of the provincial health laws as required of the individual and the municipality. For the accomplishment of such work this Board should issue proper literature in the form of a text book, pamphlets or bulletins and arrange for the delivery of a course of lectures at any place signifying its willingness to prepare for the same.

Should the Government not be prepared to endorse the scheme of county or district health officers, some plans must be devised for the holding of Health Institutes for M.H.O.'s and members of local Boards of Health at certain provincial district centers, attendance at which shall be compulsory upon the former and conditionally to the latter, at the expense of the municipality they represent, such institutes to include lectures upon subjects prescribed by this Board, with the delivering of one or more public addresses during the session which should continue for three days.

As an example of the method already in operation in other countries, I submit for your consideration a set of pamphlets issued by the Board of Health of the State of Michigan, which it has published from time to time under the statutory provision of the state legislature.

The Milk Supply.

Milk to-day is one of the most important of animal foods and in the future is likely to become more so. It is the daily food of large numbers of the human race and owing to the failing lacteal qualities of the modern mother it will in a short while be the sole nourishment of infants and children, and in this score is deserving of more attention. It is also used largely in the dietry of the sick, feeble and aged. As an example of the consumption of one city, Philadelphia used 330,000 quarts daily during the year 1905, or a total annual consumption of 120,400,970 quarts The householder is so easily satisfied with the average quality of milk as delivered to his door that it may not be out of place to indicate some of the dangers of an impure milk.

In the first place, it must be remembered that milk as it comes from the cow is practically sterile or free from germs, that is supposing the cow is healthy, but it rapidly becomes dirty and laden with germs, and ordinarily, milk as delivered to the market is dirty and contaminated with germs; indeed, the conditions are such as would not be permitted in the case of any other of our food supplies.

A visit to any ordinary farm will convince the ordinary observer that the carelessness with which the milk is there handled cannot be attended with any other result. The dirt comes from the cows, the stable, the milkers themselves, from uncovered and uncleansed utensils, from flies, also during its transportation to the city and delivery therein, the bacteria gaining entrance thereto mutliply rapidly until one drop often contains from hundreds of thousands to millions. Backhans found that while the fresh milk contained 6.6 mille bacteria per c.c. that in its passage through six cleaned vessels they increased to 97.6 mille per c.c., and A. H. Stewart has shown that bottled milk so highly thought of at the present time is capable of contamination although these same bottles are sterilized.

What is of greatest moment milk may be contaminated with the pus streptococci and strephylococci, derived from the cow, and further may become the carrier of infectious diseases. Kober, Hamill and Freeman record 330 epidemics due to infected milk, ninety-nine of these being scarlet fever, thirty-six of diphtheria, 195 epidemics of typhoid fever, and during the year 1905 every important epidemic of this latter disease in the State of Massachusetts was traced to unsanitary milk. (Harrington). With a narration of these rather alarming facts it is hard to believe it would be difficult to arouse public interest in this important question.

It may not be out of place to the risk which attends the use of sterilized and pasteurized milk as too often both the medical profession and the general public are lulled into a sense of false security by using one or other of these commercial varieties. Miller, in speaking upon the subject of milk, says, "Of sterilized milk it should be understood and explained that its nutritive "properties are less than those of fresh milk; that in heating milk to a high "degree its biological properties are altered; its natural ferments, as well as "valuable antitoxin and immunizing substances are destroyed; that it may "cause scurvey, rickets, anaemia and diarrhoea, especially in young suck-"lings; and that it and pasteurized milk are but makeshifts, and can in no "way take the place of clean, fresh milk. Too often commercially heated "milk is but "renovated milk," more dangerous than ordinary raw milk "because of the false sense of security which it produces."

For some time I have felt the necessity which exists for a reconstruction of the Acts which have for their object the controlling and regulating of the milk supplies of our larger municipalities. I cannot refer to these Acts as "regulating and controlling," for in practice it is found they do not. In theory they may be excellent but practically it has been found they are a dead letter, for like many other enactments of the Legislature they have at one time or another in their history been emasculated. My only excuse for not bringing this important matter earlier to the attention of the Board is the knowledge that often more practical results follow popular agitation, than if a public servant begins the same. My personal experience during the past eighteen months has been such that I deem it a public duty to direct your attention to this most important question, for if the loss, annoyances, expense and danger to the health of a family of small children are as proportionate in other households in this city, where perhaps less attention has been personally given to the keeping of the milk after delivery to the house than they have been in my own, then there is every justification for my present action.

Enquiry along these lines simply confirms this personal experience, and if confirmation were required it may be found in the Bulletin (No. 121) of the Laboratory of the Department of Inland Revenue, Ottawa, issued as recently as June 27th, 1906.

This report deals with the analysis of 332 specimens of whole milk collected in all portions of the Dominion, and of this total the following cities of Ontario contributed as follows:—Ottawa, 30; Kingston, 23; Toronto, 31; London, 24; a total of 108, or one third of the whole number reported on.

The relative standing of the Ontario specimens as compared to the total number examined is shown in the following table:

----	Dominion.	Ontario.
Total number of specimens	319	107
Genuine	189 (59.2%)	51 (47.6%)
Doubtful	85 (26.7%)	45 (42.0%)
Adulterated	45 (14.1%)	19 (17.7%)

The figures "Genuine" show the specimens to be lower in Ontario than is the average for the Dominion, a marked increase in the doubtful specimens and an increase in the percentage of adulteration as compared with the whole.

It is interesting to note that the average as given for butter fat is 3.75 per cent. for the Dominion; while for the Province of Ontario it is slightly in excess of this being 3.84. The two great cities, however,, seem to suffer in this regard, the average of 23 samples in Montreal showing 3.46 and the 31 Toronto samples averaging 3.49. The quality of the milk as judged by the butter fat being decidedly below the Dominion average, whether due to watering of the milk or the shipping of inferior grade to the large cities, or the removal of some proportions of cream, or the use of "skimmed" milk, cannot be stated with definiteness.

To summarize—The milk supply of our cities and larger towns is not satisfactory; the present law is ineffective and does not properly safeguard the consumer; the demand is for a "*pure milk*" supply, with certain fixed standards as to butter fat, solids and bacterial count; the delivery twice daily of milk not more than thirty-six hours old; the licensing of all dairies and milk vendors with a regular inspection of cattle and dairy premises, as of the premises of all vendors and dealers for this purpose. For this it will be essential for this Board to draw up a series of regulations covering these points. To assist the Board in this particular, I submit for your consideration some of the recent enactments upon this question.

Rules of Copenhagen Society for Supply of Milk.

(*A.*) FEEDING AND MANAGEMENT OF THE COWS.

1. The food of the cows must be fresh, and in a good state of preservation. It must also be free from elements which must give to the milk an abnormal flavor or color.

2. In summer the cows must be put out to grass or clover. In case of necessity it is permissible to give them—but always out in the open—some dry forage and cut corn. It is forbidden to leave them in their sheds at this time of the year.

3. The farmer must arrange beforehand with the company what food he purposes to give the cows during the winter.

4. He is under any circumstances bound to conform to the following rules:—

(*a*). *Roots.*—Carrots and beet roots shall be given in the proportion of one bushel and a half per cow, but conditionally on their being mixed with at least five pounds of corn, bran and oil-cake. Cows supplying milk for infants, to receive them only in the proportion of half a bushel. Turnips, rape, colewarts, swedes, turnip or beet root leaves are excluded from the food.

(*b*). *Oil-cake.*—Colza oil-cake and sunflower oil-cake may only be employed in the proportion of at most 1 lb. mixed with at least 5 lb. of corn and bran. It is forbidden to give cake to cows supplying infants' milk.

(*c*). All distillery refuse, etc., is forbidden.

5. Before housing the cows in the autumn, the tails, hindquarters and udders must be clipped.

6. The periods of calving must be so regulated that the quantity of milk sent to the society during the months of September and October shall not be less than the average quantity delivered during the first four months of the year. A farmer desirous of delivering a greater quantity than he is in the habit of supplying, must previously arrange with the society to do so.

7. The milk of cows after calving must not be supplied during the first fifteen days after lactation; the society also refuses to receive milk from sick cows, or from cows that yield a maximum of not more than six litres a day.

(*B.*) MILKING.

8. Milking must be done with the greatest care and cleanliness, and should normally take place under the following conditions:—

(*a*). Milkers must wear, while milking, a special dress, and be supplied with a towel in case they require to wash their hands.

(*b*). During milking time the shed should be well lighted, especially behind the cow, so that the operator may milk in an orderly and cleanly manner.

(*c*). Immediately after milking, the milk must be passed through a metal sieve covered with a fine clean cloth.

(*d*). The milk must then, in all seasons, be passed through a refrigerator, which should lower its temperature to 4° R. (5° C. or 37° F.) It must be kept at this temperature until the time of despatch.

(*e*). Manure must be removed in the morning after milking, and the removal must cease in the afternoon, at least one hour before the evening milking.

(*f*). Milk coming from cows beginning lactation, that coming from cows declared sick, as also that of cows giving less than six litres a day, must be collected separately, to prevent its being mistaken for, and mixed with the normal milk destined for the company.

9. The farmer is required to keep a stock of fresh ice of at least 30 lb. to 100 litres of milk.

10. To cool the milk he must use the Lawrence apparatus, he can hire from the society.

(*C*.) DELIVERY OF MILK.

11. Milk is to be delivered once or twice a day, according to the requirements of the company, at the nearest railway station, whether full, "half-skimmed" milk, or cream. It should only leave the farm in time to arrive at the station at the given time. In summer the milk wagons must have an awning to shade the milk from the sun.

12. The society supplies the cans for the transport of the milk.

13. On arrival at the farm the cans must be carefully rinsed in cold water to free them from the dust or dirt they may have picked up on the way from the factory, then placed up side down in an airy place, where they must remain until required.

14. The use of the cans for any other purpose than milk transport is absolutely forbidden.

(*D*.) VARIOUS OBLIGATIONS.

15. The suppliers are held, by their word of honour, to answer all inquiries made by the society respecting the furnishing of milk.

16. They are bound to permit their cow sheds to be inspected by the Veterinary Surgeon of the company whenever he thinks it necessary. They must fetch the Veterinary Surgeon from the station on arrival and take him back there on departure, and they must carry out his instructions faithfully.

17. Cows declared tuberculous by the Veterinary Surgeon must be isolated immediately, and sold or destroyed as soon as possible.

18. All calves brought up with the object of yielding milk must have been, since 1896, submitted to the tuberculin test, and the injections must be repeated at least once a year in those who have not reacted to the test. (Since January 1st, 1898, the tuberculin test has been made obligatory for those cows or young cattle put in reserve on suspicion of sickness).

19. If, in the interval between two of the Veterinary Surgeon's visits, signs of illness be noticed in the cattle, the farmer must at once inform the company, and keep back the milk until the veterinary surgeon has investigated the case and sent in his report. Meanwhile, in the interval, the milk is paid for by the society, as though it had been delivered.

20. Suppliers are bound to watch with the keenest attention the sanitary state of all persons employed by or resident on the farms, as also that of their families. They are required if any case of infectious illness occur to notify the fact immediately to the company, who at once take steps to check the evil. In this case the society refuses to receive the milk until such time as all traces of illness have disappeared, but it pays for it as if it were receiving it.

21. If the company finds the milk of a quality inferior to the standard and therefore unsuitable for sale, it reserves the right to reject it without paying any compensation to the farmer.

22. Either of the contracting parties can, on giving six months' notice, terminate the contract from January 1st of each year.

23. If owing to an epidemic or some cause impossible to foresee the sale of milk at Copenhagen should be suspended, the supplier must keep his milk for a longer or shorter period, and shall not have in this case a claim to any compensation from the company.

Requirements for Inspected Milk.

1. *The Barnyard.*—(*a*). It must contain no manure in summer, and none in contact with stable in winter; (*b*). It must be well drained and kept reasonably clean.

2. *The Stables.*—(*a*). The ventilation and light must be sufficient for the number of cows stabled, so that the barn shall be light and air never close; (*b*). the floors shall be of wood or cement; (*c*). the ceiling shall be tight if a loft above is used; (*d*). basins, hand brushes, clean water, soap, and clean towels shall be provided in the barn or adjacent dairy room; (*e*). the stables shall be whitewashed in the fall, and in the spring if necessary; (*f*). a sufficient number of lanterns shall be provided to allow the milking to be carried on properly; (*g*.) clean the ceiling and sidings once a month; (*h*). the bedding shall be shavings, sawdust, dried leaves, cut straw, or other material that meets with the approval of the Commission; (*i*). the soiled bedding must be removed daily; (*k*). the application of land plaster or lime on the floor daily is recommended.

3. *Water Supply.*—Pure water must be used for all purposes. It must be accessible and abundant.

4. *The Cows.*—(*a*). Discard milk containing mucus or blood, and that from any diseased cow; (*b*). reject milk from any animal forty-five days before and six days after calving; (*c*). the cows must be kept from lying down between cleaning and milking. This can be done by means of throat latches.

5. *The Milkers.*—(*b*). Thoroughly wash the hands with soap and water and brush before milking. If they become moistened with milk they must be wiped dry with a clean towel.

6. *Utensils.*—(*b*). All dairy utensils must be absolutely clean and free from dust.

7. *The Milk.*— (*b*). Must average four per cent. of butter fat; (*c*). cooling must be done within thirty minutes after milking. Temperature of milk must be reduced to 55° F. within two hours of milking, and to 50° F. within three hours, and kept below that temperature until delivered to the consumer; (*d*). when delivered to the consumer the milk must not average over 100,000 bacteria per cubic centimetre from May 1st to Sept. 30th, and not over 60,000 bacteria per cubic centimetre from October 1st to April 30th. If the Commission's requirements are fulfilled the bacteria will not be in excess of the number permitted.

8. *Inspection.*—(*a*). The farms which furnish "inspected" milk must always be open to inspection by the Commission; (*b*). samples of milk must be submitted for bacteriological examination once a month.

Contract of Aylesbury Dairy Company, London, England.

All milk to be of good quality, and to be delivered in a pure and good condition.

The whole of the product of each cow to be sent at each meal—that is the sender on no account to allow his cows to be partly milked and to send the first portion only to the company and keep back the "strippings" for feeding calves or for any other purpose.

No cream to be removed or in any way abstracted from the milk.

No water or other ingredient or material to be added to or mixed with the milk.

Milk yielding less than 3.25 per cent. "fat" and 8.75 per cent. "solids not fat" to be regarded as not complying with the term "good quality," the reports of the company's analyst to be accepted without dispute.

No milk to be sent from any cow that is not in good health, or that is under physic.

No milk to be sent from a newly-calved cow or from a newly-purchased cow until she shall have been in possession of the sender one clear day, or from any cow whose calf has been removed, for the space of one clear day after removal.

No mixed milk of two separate meals to be sent.

All milk to be sent away fresh, that is—the morning's milk to be sent the same morning, and the evening's milk the same evening—summer and winter.

All milk to be properly strained as soon after being taken from the cow as possible, and before it is put into the churns.

All milk to be thoroughly cooled, immediately after milking, over a refrigerator, which shall be of a description satisfactory to the company, and to which an ample supply of water from the source or sources only passed by the medical officer of health for the district and by the company's analyst, and described at the end of this contract, shall be provided, and the drainage from which shall not be connected with any covered drain. Milk to be considered as not having been thoroughly cooled, when the temperature on arrival at the company's dairy, is found to be higher than the average temperature of milk of the same meal received from other farms.

N.B.—The sender to daily examine his refrigerator and the in-flow and out-flow pipes, etc., in order to see that everything is in thorough repair, and that there is not any leakage.

All pails. strainers. railway churns, refrigerators. fittings. and other vessels and implements brought into contact with the milk. to be thoroughly inspected before being used. to be properly cleansed. scalded. and dried immediately after being used. and exposed to the air in a clean place. without lids or covers, and turned bottom up so to admit of free circulation of air inside.

No other than boiling water. or water that has been boiled in a boiler not used for household purposes. properly fixed in a suitable place, and provided with an ample supply of water from the source or sources only passed upon by the medical officer of health for the district. and by the company's analyst. and described at the end of this contract. to be brought into contact with any vessel or implement used for the reception, cooling, or storage of milk.

The sender to send no purchased milk. that is. no milk other than that produced on his own farms. unless by agreement with the company. In case it be agreed that a sender be allowed to purchase milk. it shall only be on condition that he is equally responsible for such purchased milk as he is for that from his own cows, under all heads of this contract.

Sender not to interfere in any way with the drains, or make any structural alteration from the condition in which they were when seen by the company's inspecting engineer without first notifying the same to the company, fully describing the intended alterations or repairs—and on the completion of such alterations. the sender to inform the company of the same. in order that they may send to inspect them, if necessary.

Should any disease of a contagious or infectious character, such as diphtheria. smallpox. or scarlet fever occur in the house or family of the sender, or in that of any of his servants employed on the form, or should any member of the families of his servants. or any visitor or temporary resident in the house of the sender. or in the house of any person employed upon his farm, have suffered from any such disease within one month of the date of such person's arrival. the person so affected. or who may have been affected, and those persons living in the same house who have in any way personal communication with such person. to be prohibited and prevented from coming into or near the dairy or cowsheds. or from taking part in the dairy operations. and the sender to immediately give information to the company in order that the directors of the company may use their own judgment as regards the use of the milk, they guaranteeing that the sender shall not sustain any loss.

Should anything be found to exist at any time. either on the farm or in the family of the sender. or in that of any of his servants. deemed by the company to be. or likely to become. dangerous to the public health. the company reserves power instantly to cease taking the milk. and. if it please, to terminate the contract. The farmer contracts further to allow the representatives of the company to enter and inspect the farm at any time. and to take samples of milk. either at the farm or while the milk is in course of delivery. Before the farm is finally accepted it is inspected by the company's engineer. During the continuance of the contract a report is made monthly to the company by the medical officer of health of the district regarding the health of the inmates of the farm house. and of all persons employed upon the farm and their families, as also upon the general health of the surrounding neighborhood, especially with reference to zymotic diseases. He also reports on the general sanitary condition of the farm house. farm buildings. dwellings and premises; further, the medical officer of health has authority to visit a farm as often as he thinks necessary in the company's interests, and his fees are paid by the company. A monthly report is also made by a veterinary inspector upon the health of the cows and the condition of the cow-houses; each local veterinary surgeon reports direct to Professor MacFadyean as to any cow not in good health. and takes instruction from him direct. Professor MacFadyean, whose services are retained by the company for this purpose. advises as to the course which should be taken. and. pending the receipt of orders from Professor MacFadyean. the veterinary surgeon has power to direct that the cow shall be isolated and its milk withheld. As will be seen. the nature of the contract with the farmer makes it in his interest to report to the company cases of illness in his family. among the workers on his farm. or in the cows. The farmer is liable to a penalty for failing to report. whereas if he does so the milk. though not used. is paid for by the company so long as the contract lasts.

With regard to tuberculosis. the veterinary surgeon reports the occurrence of suspicious symptoms in any animal. and takes a sample of the milk, which is submitted at once to Professor MacFadyean. and if the bacillus tuberculosis be found the cow is condemned. If it is not found. the farmer is given the alternative of withdrawing the cow. or of submitting it to the tuberculin test. An interval of three days must be allowed after calving before the milk is supplied. The farms which supply the company are situated in various parts of England. even as far distant as Cheshire.

STATE OF ILLINOIS.

A recent report of the State Board of Health of Illinois gives the following as misdemeanors under the laws of that state punishable by fine or imprisonment, or both:—

(1) Adulterated milk for the purpose of sale for human food with water or any foreign substance.

(2) Knowingly sell for human food milk from which the cream has been taken without the purchaser being informed or knowing of the fact.

(3) Knowingly sell for human food milk from which what is commonly called "strippings" has been taken without the purchaser thereof being informed or knowing the facts.

(4) Knowingly sell for human food milk drawn from a diseased cow, knowing her to be so diseased as to render her milk unwholesome.

(5) Knowingly sell for human food milk so tainted and corrupted as to be unwholesome.

(6) Keep cows for the production of milk for sale or exchange in an unhealthy condition.

(7) Knowingly feed cows upon food that produces impure, diseases and unwholesome milk.

(8) Offer for sale in any city of the state any milk from which the cream or any part thereof shall have been taken, or sell the same except as "skimmed milk," and fail to have each can or vessel in which such milk is carried or exposed for sale plainly and conspicuously marked with the words "Skimmed Milk."

The standard of analysis as approved by the law of June 7th, 1897, is:—

Water, 88 per cent.; milk solids, 12 per cent.; the latter to contain not less than 3 per cent. butter fat.

STATE OF NEW JERSEY.

The laws of the State of New Jersey provide for the licensing and regulating of milk dealers and their agents in cities, incorporated boroughs, or police, sanitary and improvement commissions, and incorporated camp-meeting associations or seaside resorts:—

Any person twice convicted of violating the state laws governing the sale of milk, is prohibited for the space of two years from conducting or engaging in the milk business anywhere within the state.

An officer of the state board having reason to believe any milk is contaminated with the emanations, exhalations or discharges of any person sick with communicable disease, may prohibit the transportation or sale of any such milk, or any milk produced, stored, kept or found upon any premises so infected, and such prohibition shall remain until the prohibition has been removed—both prohibitions to be in writing—under a penalty or $100.00.

The most recent enactments of this State, April, 1906, are as follows:—

1. No person or persons, firm or corporation buying or receiving milk or cream for the purpose of selling the same as such, or for manufacturing the same into butter or cheese, condensed milk or other food of human beings, shall place, keep or store the same in any vat, tank, can, bottle, vessel, utensil or other receptacle which is unclean, and every building or structure in which milk or cream is received, and which milk or cream is intended for sale, shall be provided with an abundant supply of pure and wholesome water, and shall be provided with adequate facilities for the cleansing of all receptacles and utensils employed in handling milk or cream. The interior surfaces of the walls and ceilings of all such buildings and structures shall be smooth and kept free from dust. The floors of all rooms in such buildings in which milk is received or kept or handled shall be impervious to water, and the surfaces shall be so graded that waste fluids will flow into a water-tight drain and be finally disposed of in a manner which will not create a nuisance. No portion of any creamery building shall be used as a dwelling nor as a laundry or kitchen.

2. No person or persons, firm or corporation shall operate or conduct any creamery for the reception from dairymen, farmers or producers, of any milk or cream intended for sale, or for the manufacture of the same into butter, cheese, condensed milk or other food for human beings, unless a license shall first have been granted by the board of health of the State of New Jersey to the owner or owners or manager or operator of said creamery or establishment, authorizing said owner or owners or manager or operator to engage in said business, receiving, storing, handling, selling and distributing milk or cream, and said license shall be granted by the said board under such rules and regulations as the said board may from time to time adopt.

3. If any such person, so licensed, shall violate any of the provisions of this Act, or any of the rules and regulations provided for in section two of this Act, he or

they shall forfeit his or their license, and no new license shall be granted to the said party or parties until the requirements of this Act and of the said rules and regulations shall have been complied with.

4. It shall be the duty of the State Board of Health to notify in writing the Local Board of Health of every sanitary district in which milk or cream is sold, and which milk or cream is found to be collected, stored, transported or distributed under unclean or unwholesome conditions.

5. Any person or persons who shall operate or conduct a creamery or establishment for receiving milk or cream from dairymen or producers for distribution and sale, or for manufacturing the same into butter, cheese, condensed milk or other food for human beings, without holding a license as provided for in section two of this Act, shall be liable to a penalty of two hundred dollars, said penalty to be recovered in the same way and manner as similar penalties recovered under the provisions of the Act to which this Act is a further supplement.

6. The word "creamery" as used in this Act shall be construed to mean any establishment where milk is received or stored for sale or distributed by wholesale, or for the manufacture of the same into butter, cheese, condensed milk or other food for human beings.

In addition to the foregoing, the following ordinances are in force in every municipality:—

Sec. 1. No person shall sell or deliver or have in possession for sale any milk which has been watered or adulterated, or which contains any unhealthy ingredient, constituent or substance, or which has been transported or stored in an unclean manner, or which is produced from cows which are kept or stabled under unhealthy conditions, or which may be diseased.

Sec. 2. Any person engaged in the sale of milk shall furnish forthwith, when requested so to do by the board of health, or any inspector or officer thereof, a true statement, in writing, upon blanks to be supplied by said board of health, setting forth the locality from which said milk was procured, and also a full and complete list of the persons from whom said milk was purchased, and the names and addresses of all persons and customers to whom such person or persons selling said milk shall supply or deliver the same. Said written statement shall be signed by the person or persons selling said milk.

Sec. 3. It shall be the duty of any person or persons engaged in the sale of milk to notify the board of health immediately upon changing the source of supply of the milk sold by them. Such notices shall be in writing and they shall state the name or names of persons supplying said milk and the locality from which such milk is procured.

Sec. 4. No milk shall be transferred from any can or other vessel to any bottle or other container in the streets or any other public place, except when said transfer shall be made to the vessels of the purchasers at the time of delivery. Containers in which milk is kept for sale shall be kept covered in a manner which will exclude dust and other impurities. No milk shall be kept for sale in a room which is used as a bedroom or as a living room or kitchen, nor in any room adjoining the same. Before filling bottles with milk which is to be sold, said bottles shall be washed and made clean, and bottled milk shall be sold only when the bottles are filled on the dairy premises where the milk is produced or in a licensed creamery. Any person or persons or corporation who shall violate any of the provisions of sections 1, 2, 3 or 4 of this ordinance shall forfeit and pay a penalty of fifty dollars.

Sewerage and Water Systems.

The growth of our cities and towns during the past few years has brought most prominently before the public the need for a more careful disposal of sewage in order to protect the water supply not only of their own municipality, but of other municipalities and private individuals.

The fact is being brought home to the public that the first essential of urban and rural municipalities is a pure water supply, and to secure this it is essential that raw sewage deposited in either stream or lake is a permanent menace to this essential of life, and public funds must be expended to install, equip and annually manage suitable sewage disposal plants. In many of our manufacturing towns the question is complicated by trade wastes, the discharge of which into public systems without a preliminary treatment as the works very materially affects the question as compared to those instances where the sewage is mainly domestic in character. Naturally the municipal authorities look to this Board for aid in the solution of these problems and I am pleased to inform you the Government this year set apart the sum of $6,000.00 as a preliminary grant for the installation of an experimental plant, and already steps have been taken to secure a site in this city, and I hope soon to be able to state that with the co-operation of the Medical Health Officer and City Engineer of Toronto the work has been begun.

In this connection I would urge that this Board be empowered to require municipal authorities to place sewage disposal plants in the care of qualified men. A good plant soon becomes worse than useless unless it is daily under observation. It is also necessary that this Board should have a constant oversight of all sewerage and water systems—the inspections being made at least semi-annually by the Medical Inspector or other officer of the Board, and at the same time reports should be made to the Board by all municipalities in which such public services are operated, whether owned by the municipality or private corporations. If some provision of this kind is not instituted at an early date the difficulties as regards the sewage problems of this province will become serious and what are now potable water supplies will sooner or later become sewage contaminated.

In regard to water systems there is every reason for this Board to place some regulations upon systems where filtration is necessary and I submit herewith the regulations of the German Government in this regard.

Regulations of German Government *re* Water Companies.

(1) In judging the quality of a filtered surface water, the following points should be specially observed:—(*a*) The operation of a filter is to be regarded as satisfactory when the filtrate contains the smallest possible number of bacteria, not exceeding the number which practical experience has shown to be attainable with good filtration at the works in question, in those cases where there are no previous records showing the possibilities of the works and the influence of the local conditions, especially the character of the raw water; and until such information is obtained it is to be taken as the rule that a satisfactory filtration shall never yield an effluent with more than about 100 bacteria per cubic centimetre. (*b*) The filtrate must be as clear as possible, and in regard to color, taste, temperature and chemical composition, must be no worse than the raw water.

(2) To allow of a complete and constant control of the bacterial efficiency of filtration the filtrate from each single filter must be examined daily. Any sudden increase in the number of bacteria should cause a suspicion of some unusual disturbance in the filter, and should make the superintendent more attentive to the possible causes of it.

(3) Filters must be so constructed that samples of the effluent from any one of them can be taken at any desired time for bacteriological examination.

(4) In order to secure uniformity of method, the following is recommended as the standard method for bacterial examination:—The nutrient medium consists of 10 per cent. meat extract gelatin with peptone, 10 cubic centimetres of which is used for each experiment. Two samples of the water under examination are to be taken, one of 1 cubic centimetre and one of ½ cubic centimetre. The gelatin is melted at a temperature of 30 deg. Cent. to 25 deg. Cent., and mixed with the water as thoroughly as possible in the test-tube by tipping backwards and forwards, and is then poured upon a sterile glass plate. The plates are put under a bell-jar which stands upon a piece of blotting paper saturated with water, and in a room in which the temperature is about 20 deg. Cent. The resulting colonies are counted after forty-eight hours, and with the aid of a lens. If the temperature of the room in which the plates are kept is lower than the above, the development of the colonies is slower, and the counting must be correspondingly postponed. If the number of colonies in 1 cubic centimetre of the water is greater than about 100, the counting must be done with the help of Wolffhügel's apparatus.

(5) The person entrusted with the carrying out of the bacterial examinations must present a certificate that he possesses the necessary qualifications, and wherever possible he shall be a regular employee of the waterworks.

(6) When the effluent from a filter does not correspond with the hygienic requirements it must not be used, unless the cause of the unsatisfactory working has already

been removed during the period covered by bacterial examinations. In case a filter, for more than a very short time, yields a poor effluent, it is not to be used until the cause of the trouble is found and corrected. It is, however, recognized from past experience that sometimes unavoidable conditions (high water, etc.), render it impossible, from an engineering standpoint, to secure an effluent of the standard quality. In such cases it will be necessary to use a poorer quality of water; but, at the same time, if such conditions arise as outbreaks of epidemics, suitable notice should be given of the condition of the water.

(7) Every single filter must be so built, that when an inferior effluent results, which does not conform to the standard, it can be disconnected from the pure-water pipes, and the filtrate allowed to run to waste. This wasting should as a rule take place, so far as the arrangements of the works will permit.—(*a*) immediately after scraping a filter; and (*b*) after replacing the sand to the original depth. The superintendent must himself judge, from previous experience acquired by the continual bacterial examinations, whether it is necessary to waste the water after these operations, and if so, how long a time will probably elapse before the water reaches the standard purity.

(8) The best sand filtration requires a liberal area of filter surface, allowing plenty of reserve, to secure, under all local conditions, a moderate rate of filtration adapted to the character of the raw water.

(9) Every single filter shall be independently regulated, and the rate of filtration, loss of head, and character of the effluent shall be known. Also each filter shall, by itself, be capable of being completely emptied, and, after scraping, of having filtered water introduced from below until the sand is filled to the surface.

(10) The velocity of filtration in each single filter shall be capable of being arranged to give the most favorable results, and shall be as regular as possible, quite free from sudden changes or interruptions. On this account reservoirs must be provided large enough to balance the hourly fluctuation in the consumption of water.

(11) The filters shall be so arranged that their working shall not be influenced by the fluctuating level of the water in the filtered-water reservoir or pump-well.

(12) The loss of head shall not be allowed to become so great as to cause a breaking through of the upper layer on the surface of the filter. The limit to which the loss of head can be allowed to go without damage is to be determined for each works by bacterial examination.

(13) Filters shall be constructed throughout in such a way as to insure the equal action of every part of their area.

(14) The sides and bottoms of filters must be made water-tight, and special pains must be taken to avoid the danger of passages or loose places through which the unfiltered water on the filter might find its way to the filtered-water channels. To this end special pains should be taken to make and keep the ventilators for the filtered-water channels absolutely tight.

(15) The thickness of the sand-layer shall be so great that under no circumstances shall it be reduced by scraping to less than 30 centimetres (-12 in.), and it is desirable, so far as local conditions allow, to increase the minimum limit. Special attention must be given to the upper layer of sand, which must be arranged and continually kept in the condition most favorable for filtration. For this reason it is desirable that, after a filter has been reduced in thickness by scraping, and is about to be refilled, the sand below the surface, as far as it is discolored, should be removed before bringing on the new sand.

(16) Every city in the German Empire using sand-filtered water is required to make a quarterly report of its working results, especially of the bacterial character of the water before and after filtration, to the Imperial Board of Health.

(17) The question as to the establishment of a permanent inspection of public water works, and if so, under what conditions, will be best decided after such quarterly reports have been furnished over some period of time.

The Care of the Consumptive and Municipal Responsibility.

It would almost seem ridiculous to again direct the attention of the people of this province to the crying need of the dying consumptive, hundreds of whom are now to be found in every county in Ontario, the majority perpetuating the disease by spreading infection amongst the loved ones, thus leaving to municipalities a legacy which becomes an increasing burden, at present unappreciated but none the less evident. It is true some slight promise has been made by a charitable association chartered for the specific purpose of caring for the fortunate few they can accommodate in the institutions supported by that charity and its subdivisions and offshoots.

A recent publication in referring to the Toronto Free Hospital for Consumptives states for that one institution alone "the trustees have expended over $40,000 in lands, buildings and equipment, aside from heavy monthly bills for the maintenance of patients and staff that have to be met regularly somehow. We state the case frankly when we say that this has only been possible through the kindness of our bankers." The trustees are therefore forced to make prominent their work and expend money in appeals for public aid for this free hospital which bears the name of the richest city of the Province regarding cases from which city the trustees state: "It cannot be too plainly stated that not a single person, resident of Toronto, who has made application for admission to the Toronto Free Hospital for Consumptives, has ever been refused admission because of his or her inability to pay."

This condition of affairs as regards consumption bespeaks a degree of public indifference to the work in no way commensurate with the gravity of the situation and the responsibilities of municipalities in respect to the care of unfortunate indigent consumptives.

The work carried on for so many years as a charity is deserving of commendation, but charity has its limitations and municipalities have yet to realize their responsibility in regard to the initiative of precautionary measures and the care of the class just referred to. The disease is contagious and must be classed with others of the same group, which under the Public Health Act must be cared for by municipal authorities—either at their own cost and charge or at the cost and charge of the municipality, hence municipal councils are authorized to erect and maintain isolation hospitals and quarantine depots for which they receive no provincial assistance.

In the case of consumption the Provincial Legislature has made a proper and generous exception for under the Sanatoria Act—a grant up to $4,000 is provided on account of land and buildings, and a weekly allowance of one dollar and a half per patient—a generous statutory provision which as yet has not been followed so far as I am aware by any province in the Dominion or state of the Union.

If, therefore no progress has been made in the way of municipal sanatoria for the indigent and poor tuberculous of this Province, the fault cannot be laid at the door of either the Provincial Board of Health, who fathered the measure, or the Government, which passed or that which now stands by and is willing to aid to the full extent of the Act.

With the object of aiding in the education of the public along this and other lines as relating to consumption, I am pleased to inform you that the Hon. Mr. Hanna has approved of the collecting of photographs, plans, models and other material—as illustrative of the modern methods of treating and providing for the care of those suffering from this disease—the collection to be exhibited in the cities and towns of Ontario and explained by lecture and lantern views. This educational movement cannot fail to be of untold benefit and will, I trust, result in more practical work on the part of municipal authorities, and will at the same time stimulate the charitably inclined.

As an evidence of the liberal interpretation placed upon the Sanatoria Act by the Government, aid to the extent of $8,000 has already been made on account of purchase and construction of two local charitable organizations, both of which, although not working exactly along the lines of the Act, yet are doing the work outlined therein, and in addition to this sum has at different times voted aid to the charity known as the National Sanatorium Association.

It may be a financial impossibility for a municipality to care for all of its consumptives in sanatoria—indeed, I do not think this is a necessity, but these authorities can and should establish some system of dispensing treatment with home oversight by qualified visitors or nurses and all necessitous cases, and the majority are of this class, should receive aid in the way of pure milk, fresh eggs and other suitable food. In addition to this there should be a notification of all cases (confidentially) to the local health authorities with the enforcement of proper sanitary precautions.

The Tuberculosis (International) Congress of 1905, resolved as follows:

That tuberculosis, a communicable disease, is nearly always contracted by the infant in a contaminated family centre;

That tuberculosis of the adult is more frequently a tuberculosis of infancy which has remained latent and unrecognized;

That consequently the safeguarding of the infant is the most valuable and efficacious means of combating tuberculosis, which is essentially a social malady.

That whatever may be the gate of entry of the tubercle bacillus pharynx, lung, intestine, skin—the means of prevention must always have regard before everything to home infection.

That in so far as the child already infected is concerned, its tuberculosis, whether pulmonary or glandular, is more easily cured in childhood than at any other age, provided the disease is early recognized and treated.

That if the tuberculosis condition of the infant were thus recognized and treated at its commencement the local tuberculosis would be cured or at least would remain "closed" until adult age, a fact which would prove a great social gain.

The Congress, having regard to the above considerations, proposed the following resolutions:—

Resolution 1.—In order to ensure the preservation of the infant in the home, it is necessary—

(*a*) To maintain the house in a state of wholesomeness and perfect cleanliness.

(*b*) To boil or sterilize the milk which the infant consumes.

(*c*) That in the event of the family circle being contaminated the child should be removed as soon as possible. And that poor children should be confided to institutions based on the model of the Society for the Preservation of Infancy founded by Professor Grancher.

(*d*) To direct the efforts of the maternal and scholastic friendly societies towards the principle of preservation by means of personal hygiene, rational feeding, and a house to which sun and air can gain free access.

Resolution 2.—In order to ensure the preservation of the child at school, it is necessary—

(*a*) To ensure the sanitary condition of the premises and of the furniture.

(*b*) To increase, and, if possible, to make general school canteens modelled on those of Saint Etienne of Paris, Roubaix, etc.; to increase the holiday colonies, to inculcate the principles of hygiene into the child, and, more particularly, to teach him the necessity of living in the pure air, to practise physical and respiratory exercises, and to see to the cleanliness of his person.

In so far as boarding schools are concerned, to insist on a sufficient time being spent in the open air and in the performance of carefully regulated physical exercises.

(*c*) To search out in schools the tuberculous children by a careful medical examination of all on the lines laid down by Professor Grancher and his pupils in the Paris schools.

(*d*) To take care of the suspected or already affected child for as long a period as possible by administering better food and by country schooling.

Resolution 3.—To complete these measures of preservation by supplying different means of assistance to the invalid child, especially by the high altitude cure.

It is especially important to make extensive use of marine sanatoria, the action of which is most efficacious on the pre-tuberculous, and on those suffering from external and glandular tuberculosis.

The Sanitary Work of Factory Inspection.

Owing to anomalies which exist in respect to the rules which apparently guide governments in the delimitations of the limits which mark the boundary as between municipal responsibility and that which is distinctly provincial as sanitarians we frequently find difficulties arise which apparently reflect somewhat on this Board.

The most glaring example is that of factory inspection which is in the main strictly within the Province of a public health work and in European countries is so recognized, being there in part a state responsibility and in part a municipal charge. In this Province the whole cost and charge is borne by the Province, though on what line of argument the burden is thus placed it is difficult to tell particularly as public health work is entirely a municipal one. Thus two works which not only impinge upon one another at many points, but often overlap, dovetail and duplicate are offered and managed in two different ways. And again the provincial control of health and factory branches are under separate ministers of the Crown, the latter under Agriculture, while the former is administered by the Honourable the Provincial Secretary. With this diversity of control and methods of operation the work can never be satisfactorily performed, particularly those duties which are indisputably sanitary in character, for be the factory inspector as thorough as possible he or she will at times reach a point where their duties cease, and where those of the local health authorities begin, and to them he must look for the carrying out of sanitary changes deemed necessary by the factory inspector representing provincial authority. Difficulties occur at this point of the work—the local authorities for obvious reasons deem the existing conditions satisfactory and fail to respond to the demands of the inspector as representing the Province. As a result of this deadlock the inspector is discredited and the old order of things continues often to the detriment of the health of the employees.

The remedy may be sought for in two ways—place the responsibility of local factory inspection on local health authorities—be these local or district—leaving the general supervision and inspection to provincial officials, who to increase the scope of their usefulness should be inspectors of this Board as acting in this capacity there would be no duplication of work which is always undesirable, and there would be an increased efficiency with a material saving in annual expenditure on account of salaries and travelling expenses. By some such system as just outlined both local and provincial inspection will be carried on under the public health control.

Several instances have recently occurred which emphasize the necessity for some change in the present system. These relate more particularly to the housing of employees in canning factories, the use therein of over-ripe or rotten fruit and other minor complaints, all of which have reached me from the factory inspectors.

Dr. Bell, Medical Inspector, made a tour of inspection in company with Mr. Holmes of the Factory Inspector's staff, of the Niagara District, and returned with such an array of facts, indicating what could only be termed a disgusting condition of affairs, that I deemed it my duty to re-visit with him some of those reported upon and observe for myself conditions which were said to exist.

During the canning season the companies provide accommodation for the help required, and in the Niagara district that is obtained mostly from the States, chiefly Buffalo, N.Y., and consists chiefly of people from central Europe whose domestic habits are to say the best far from sanitary. For the housing of this help long shacks are provided by the companies, some two stories in height. The better ones are divided into compartments, varying sizes from 10 x 12 x 10 feet to 21 x 15 x 8.6 with sleeping accommodation in the way of six double mattresses, placed close together on wooden bunks, raised from the floor so that the would-be sleeper had to crawl in from the foot, the space beneath being used as a receptacle in most instances for baskets or boxes in which we found various kinds of eatables, while hung around on the walls were to be seen wearing apparel of different kinds. In one instance the ground floor room was provided as a common living room for the twelve employees who found resting place in the loft above, access to which loft was by means of a fixed ladder placed at the opposite end of the room to which was the door or entrance.

The bedding was, to say the least, far from clean, and judging by the way in which mattresses were left in those factories closed for the season no attempt is made to clean even these. It has been my duty to inspect stables for thoroughbred horses and I am free to confess I have there found better provision made for and more care exercised in the keeping of some of these stables then I found to exist in most of the factories visited. The accommodation is not up to that of a cheap lodging house, for in a place of this kind better provision exists in the way of washing-rooms and lavatories. And yet the people so housed in this Christian country are employed to prepare and can our tomatoes, peaches, corn and other food supplies. The very class of work which should call forth on the part of the employer the most rigid enforcement of the most simple laws of cleanliness are here found in most instances to be wanting. One excuse given being "these people are better housed by us than they are in their homes." This, however, is no excuse for the employers to perpetuate an evil.

The public expect from the manufacturers of pure food supplies the adoption of rules such as will give them guarantee that cleanliness in all its details is a cardinal principle in the business, such ordinary provisions as are necessary to ensure the same should be made by the employer. It was particularly noticeable that the class of employees improved in ratio to the improved conditions of the environment. The factory in which I found the best class of accommodation and that in which the employer took pains to keep clean had by far the better and cleaner lot of employees.

In conclusion, I am of the opinion rules should be drawn up by this Board regulating this part of factory work—dealing with air, space, number in rooms, the separating of dormitories from living and dining room space, with sufficient lavatory accommodation, and possibly a matron to oversee the whole should be arranged for in a similar manner as set forth in the regulations relating to the unorganized districts. Certainly personal cleanliness must be insisted upon—for that as a rule is not to be found at present.

Our Foreign Population.

During the past few years there has been an increase in the number of foreigners settling in our cities and larger towns, and from casual observation as well as from unofficial information received from various sources I fear that too often they settle here in such a manner that "overcrowding" but mildly describes their manner of living. In the European countries from which they hail the state keeps a better oversight of them than our civic authorities do in Ontario, and not knowing our language, much less our laws or the laws of hygiene, they lapse into domestic conditions which must sooner or later command the attention of local health authorities. To accomplish any good amongst them it may be necessary to print health rules in different languages or dialects and instruct local health authorities to see to their distribution. Personally, I see no other way of getting the necessary knowledge to them intelligently.

Need for change in Health Laws.

Personally, I am of the opinion the time is ripe for very material changes in the health laws of the Province, the present Act is in many particulars too great a divergence in the interpretation of many of its clauses; it is ill-adapted for all municipalities, regulations for townships are almost impractical of application in our large towns and cities.

The present system of local boards of health which has been on trial for nearly a quarter of a century is a failure in too many instances. These boards are but useless dummies appointed with the specific understanding that the members will not enforce the health laws. The importance of public health to-day demands the appointment of properly qualified men who will devote their whole time to the administration of sanitary measures, and to permit of this being done the Province should be divided into county or other districts, lines very similar to those adopted in the school system.

In addition to these changes a reorganization of the central system should take place—the chief health officer should have a competent staff—consisting, in addition to the present officers, of a sanitary engineer, and all water and sewerage systems should be passed upon immediately on their submission, and not held over for two or three months as the law requires at present—and the functions of the Provincial Board should be purely consultative.

I would further say the health department of this Province should prepare for free distribution, both vaccine and those biological products known as antitoxic serums, the chief of which is "anti-diphtheritic serum," now an essential both as a prophylactic and also as a curative, almost I may say specific remedy.

If this Province is kept abreast of the times in all that appertains to public health then all the changes and additions which I have just suggested must be introduced. Much good has been done during the last twenty-five years, but infinitely more will be required of us in the near future, and this Board must take the same into its serious consideration with a view to a submission of the results of our deliberations to the Honourable the Provincial Secretary. True, money will be required for the proposed expansion, but the lives of the citizens of this Province are at stake, not the lives of our cattle, sheep and hogs. The health of our cities is the state's wealth in the highest sense of that word, and wise preventative measures adopted and enforced by the state ensures a national asset more valuable than all the landed dollars of the best filled treasury of earth's proudest nation.

New Regulations *re* Unorganized Districts.

During the interim between the lapsing of the old Board and the appointment of the present Provincial Board of Health I am pleased to inform you the Honourable the Provincial Secretary has been pleased to approve of a revised set of regulations governing camps and works in the unorganized portions of the Province, which have been approved by His Honour the Lieutenant-Governor-in-Council under date of September 7th, 1906.

These regulations require as follows:—

Notify the Provincial Board of Health forthwith of each camp or works now operating and annually thereafter. Regulation 1.

Engage a physician to supervise the sanitary condition of your camps and works; he must inspect monthly and report in writing to the Board. Regulation 2.

All employers of labor except lumbermen must contract with physicians for medical and surgical care of employees. The maximum amount that can be legally deducted from employees' wages for such services being $1 per month. Regulation 3.

Employers of labour in lumber camps have the option of employing physician as provided in Regulation 3. Those who do not contract incur a responsibility regarding employees discharged while ill. Regulation 4.

All employers shall transmit copy of contract to Provincial Board of Health, and Board may for cause require changes. Regulation 5.

The owner, manager, agent or foreman of works or camps responsible for enforcement of regulations and Health Act. Regulation 6.

Every employer, employer's agent and physician subject to penalties of Health Act. Regulation 7.

On outbreak of contagious disease Provincial Board must be notified at once. Regulation 8.

Each and every employee, whenever requested, shall furnish certificate of successful vaccination or of re-vaccination within five years. Regulation 9.

All camps and works to have building or tent for use of employees taken ill. All camps and works to have separate isolation hospital accommodation for contagious diseases. Regulation 10.

Regulations 11 to 18, inclusive, relate to construction and sanitary conditions of buildings, etc., the providing of laundry house, bath house and kitchen, the collection and disposal of garbage, the construction of lavatories or closets.

Printed copies to be furnished employers, a copy to be kept on file in each office. Regulation 19.

Provincial Board empowered to enforce regulations at expense of employer or agent. Regulation 20.

Penalties same as section 72 of the Public Health Act. Regulation 21.

Copies of the regulations have already been mailed to the interested firms. The regulations themselves are submitted in appendix of the report.

Quarterly Report of Contagious Diseases.

I beg to submit the following quarterly return of contagious diseases for the quarter ending September 30th, 1906, together with those of the corresponding period of the last year.

Comparative Table of Infectious Diseases.

Diseases.	1906.		1905.	
	Cases.	Deaths.	Cases.	Deaths.
Smallpox	41	2	30	3
Scarlet Fever	176	10	109	5
Diphtheria	347	50	402	52
Measles	144	17	148	8
Whooping Cough	270	44	313	51
Typhoid	1,025	175	612	105
Tuberculosis	455	442	489	441
	2,457	740	2,103	665

It will be seen there has been a marked increase both in the case incidents and the number of deaths returned as due to typhoid fever, the returns for each of the three months being as follows:—

July, 80 cases and 20 deaths; August, 276 cases and 72 deaths; September 668 cases and 83 deaths. Taking, therefore, the returns of the latter months as more correctly representing the relationship between cases reported and deaths returned it would appear in August there was a considerable falling off in the notification of cases. Allowing for this discrepancy I am satisfied the corrected figures would but imperfectly represent the actual number of cases that have occurred of this preventable disease.

The greater prevalence of the disease in New Ontario during the month of September is shown in the following tables:—

Typhoid—New Ontario.

Towns and Villages.	Cases.	Deaths.	Population.
Sault Ste. Marie	24	3	7,169
Blind River	36		1,200
New Liskeard		2	1,500
Copper Cliff	19	4	1,200
Parry Sound	50	5	2,884
Rainy River	10		1,200
Port Arthur	63	5	3,114
Fort William	65	6	3,997
	277	25	22,264
Other Cities and Towns.			
Toronto	36	12	262,791
Hamilton	52	2	52,634
Brantford	7	2	16,619
Guelph	8		11,496
St. Thomas	27	1	11,485
Brockville	13	2	8,940
Galt	10	1	7,866
Midland	14		3,174
Napanee	7	2	3,142
Tillsonburg	5	1	2,242
Mount Forest	13		2,019
Stouffville	6		1,223
Stirling	6		845
St. Catharines	11		
	215	23	384,476

Table A shows 277 cases with 25 deaths in an estimated population of less than twenty-five thousand; while Table B includes some of the cities and towns of the older portions of the Province with an aggregate estimate population of less than four hundred thousand, in which there were reported 204 cases with 23 deaths. The reason for this marked increase is no doubt due in a great measure to polluted water supplies, which in the majority of instances is well water, although some of the public supplies are at fault.

The municipal authorities of the above cities and towns should at once, in the public interest, examine into the cause of this pollution and take steps to prevent the same, or seriously consider the advisability of introducing a slow sand filter plant, this being the only means by which they can guarantee a pure water to their citizens.

Report on Typhoid Fever in Fort William and Port Arthur.

By CHAS. A. HODGETTS, M. D., Chief Health Officer of Ontario.

It will be remembered the Town of Fort William has been afflicted with typhoid fever for some years, but owing to the neglect of physicians to comply with the requirements of the Public Health Act, the correct data in regard thereto is wanting. Early in the beginning of the present year, the town was visited with perhaps the most serious epidemic of the disease recorded in any town in this Province—and to show the extent of the same I cannot do better than quote from the able report of Dr. Fred. C. Douglas, presented to the town council April 17th, 1906—and submit the chart showing daily report of cases and deaths by months, both of which have been kindly furnished me by the doctor, who had charge of the outbreak.

As to the present epidemic 585 cases were reported since the first of January, not being satisfied with this report I had a census taken from the inspector's reports, which I had made up, and I find that from the last week in December, 1905, until the present date there has been over 840 cases, and from municipal census, 1905, the population was 7,691, so that on an average of one person in every 9.155 has had typhoid fever since that date.

The epidemic reached its highest point in February, when from 19th to the 25th 161 cases were reported. The total number of deaths from typhoid fever since the first of January has been 69—Canadians 36, British 8, United States 2, foreigners 22. The average age of those who died is 24, and a great percentage of these were bread winners and fathers of families.

As to the cause of this outbreak I cannot do better than quote from the report of Prof. T. A. Starkey of McGill University, Montreal, who, on the recommendation of the reporter, was engaged by the town authorities to investigate and report upon the cause of the epidemic. He says, "The causes of the typhoid fever were as follows:—

"First, a polluted water supply of the town.

"Second, personal contact or personal infection.

"Third, defective water mains,

"Fourth, the unsanitary condition of the ground, due to—

"(*a*) Defective sewerage;

"(*b*) The privy system;

"(*c*) Want of proper garbage disposal."

Having occasion to extend my visit to New Ontario to the Town of Fort William, the opportunity was afforded of ascertaining the conditions as regard typhoid fever in both Fort William and Port Arthur.

The present population of the town is estimated at about 10,000, an increase of some 3,000 since the return of 1906—accounted for by the activity in railway construction work on the three transcontinental railways which have lake terminals here.

There have been reported since July 1st, 1906, as stated by Dr. Manion, M. H. O., 201 cases, of which 159 were residents and 42 non-residents, by months as follows:—

———	Resident.	Non-resident.	Total.
July	9	....	9
August	20	4	24
September	65	26	91
October	65	12	77
	159	42	201

The deaths being reported as follows: July, none; August, 3; September, 6; October, 11.

A review of the register of the McKellar General Hospital shows that for the same date up to the day of visit, November 9th, 162 cases have been treated in that institution; 121 resident and 41 non-resident; while on the same day I found 14 patients in the special Municipal Hospital recently opened by the town authorities. It may therefore be estimated that since July 1st at least 160 cases have occurred in this town, or 16 per thousand of the population.

In the adjoining town of Port Arthur, which also boasts a population of at least 10,000, the town clerk furnished me with the following as the returns for the same months: July 6, August 7, September 63, October 19, a total of 95 cases with 15 deaths, and of these cases Dr. Laurie, M. H. O., computes at least three-fifths came from outside places, most of whom came into the hospital for treatment. The figures given are, however, considered too small.

As to the outside cases it was stated most of the patients came from either lumber camps or the camps along the lines of the railways.

Regarding the sanitary conditions of Fort William, considerable and commendable progress has been made in both sewer construction and in rushing on the laying of the water mains to Crescent Lake (temporary source), and Loch Lomond (permanent source)—on account of sewers, $185,000 has been expended, although I regret to state the septic tanks as approved by the Board have not been built at the outfalls, and raw sewage is emptied into both rivers. This is an error which should be corrected by the Board. The number of house connections installed this year has been ——, with applications now awaiting fulfilment. The chief items of interest in the water supply is the 800,000 gallon concrete reservoir now nearly completed. The pipe from this to Crescent Lake, which has been temporarily dammed at the lower end, the extension of the wooden pipe to Loch Lomond and out some distance into the same with the bringing forward of the installation of the engine and pump, when completed will pump water to Crescent Lake and thence to the reservoir.

In the meantime the townspeople are supplied by water from the driven well close to the city hall, several water carts being used to distribute the same, for domestic, commercial and fire purposes. The source of supply is the Kaministiquia River, and from the number of cases it is to be feared that some of the citizens have relaxed their vigilance as regards boiling the water —a preventative measure which cannot be too well and strongly advertised by the local Board of Health, and should be continued to do so until the waters of Loch Lomond constitute the only source of supply.

Before closing I would refer with pleasure to the fact that the town has engaged the services of a qualified sanitary inspector, one holding the certificate of the Royal Sanitary Institute—the first municipality which has availed itself of this class of official. The result of this officer's work is seen in the improved condition of the lanes and yards. It remains, however, for the council to still further his good efforts by the speedy adoption of a system of garbage collection and the installation of a town crematory.

Through the kindness of Prof. T. A. Starkey, McGill University, Montreal, who was employed by the municipality of Fort William, I am enabled to append a copy of the report of that sanitarian, which, together with the tables of deaths and cases for the months of January, February, March and April, 1906, kindly furnished me by Dr. Douglas, will furnish most interesting information respecting this severe epidemic of enteric fever—certainly the most severe which has occurred in Ontario within recent years.

Report on Outbreak of Typhoid Fever, Fort William.

By T. A. STARKEY, M.B., D.P.H. (Lond.), Prof. Hygiene, McGill University, Montreal.

On March 4th, 1906, I presented my interim verbal report with copies of notices and instructions, giving you a brief but clear outline of the causes which were at work producing the epidemic of typhoid fever. The instructions contained complete directions as to rapid reorganization of the Health Department in order to cope immediately with the outbreak and to stamp it out as quickly as possible.

The causes of the typhoid fever, enumerated on that occasion, were as follows: First, a polluted water supply to the town; second, personal contact or personal infection; third, defective water mains; and, fourth, the unsanitary condition of the ground, due to (*a*)a defective sewerage; (*b*) the privy system; (*c*) want of proper garbage disposal.

I propose now to go more fully into these four causes and in discussing them the sanitary condition of the Town of Fort William will be brought well under notice in various ways. I need not, in this report, go into the evidence as to the spread of the epidemic; that was fully dealt with in my verbal interim report. It is sufficient here to say that there was absolute proof of the epidemic being originally started by polluted water. This resulted in isolated cases scattered pretty uniformly throughout the town. These cases then acted as centres of infection, but at the time of my visit I had abundant proof that polluted water was even then answerable for some scattered cases. Seeing that the epidemic has been checked and is, so to speak, well in hand at the present time, there is little good to be done by discussing preventative measures in this report. It is only necessary for me to say that I feel sure we will thoroughly stamp it out if my instructions are carried through in their entirety, but if you are ever led into the thought because you are on the way to success you then can relax the thoroughness of the system, you inevitably will have trouble by a protraction of the epidemic.

I trust that you have been well pleased with the work and ability of Dr. Douglas and Mr. Watson, whom I sent down to you, and that you have backed them up thoroughly as you promised to do at our last meeting on March 4th.

Now to deal with the cause more thoroughly and to point out the advisability of improvements connected with the various items.

I. *The Water Supply.*—I brought back with me five samples of water and a day or two later received two more samples from the Town Clerk Mr. McNaughton. The samples were as follows:—

No. 1. From the River Kamanistiquia, 200 yards above the Canadian Northern coal docks.

No. 2. From the intake pipe of the city water supply at a point 24 feet from the shore.

No. 3. From the Canadian Pacific Railway intake pipe.

No. 4. From the town service pipe in McLoughlin Street.

No. 5. From the Neebing River, McCarthy's farm.

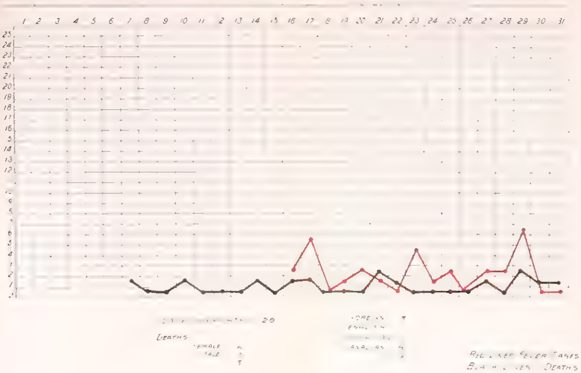
No. 6. From the artesian well at the town hall.

No. 7. From a well on Mr. McKellar's property.

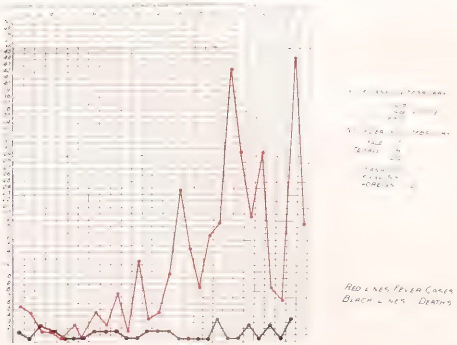
I have completely analysed these seven samples of water, both chemically and bacteriologically, the reports of which are appended in full. Comparison of the results of these waters, which will be referred to as Nos. 1, 2, 3, 4, etc., will afford some valuable evidence.

No. 1 water is apparently only liable to pollution higher up the river than the extreme western point of Fort William. This pollution may come

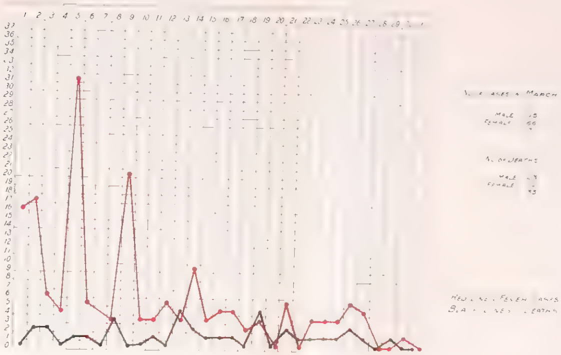
Daily Report of Typhoid Fever [illegible] Month of January 1906



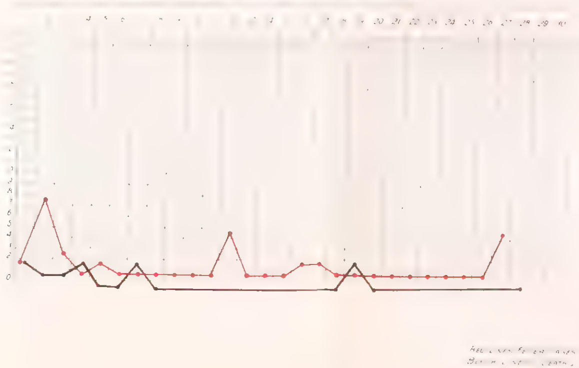
Daily Report of Cases for the Month of February 1906



Daily Report of Cases for the Month of March 1906



Daily Report of Cases for the Month of April 1906



in anywhere along its course, and in the event of bacterial infection we cannot lay down any limit as to how far the bacterial infection will carry, but certain it is that it is capable of travelling many miles. The water at the intake pipe, No. 2, is taken in at a point above which there are several small drains entering the river besides the drainage from an area of inhabitated land along the banks in which there is no proper sewage system and which can undoubtedly lead to infection. No. 3 is from the Canadian Pacific Railway intake, much lower down the river at a point below the outflows of most of the town sewage. One would expect different degrees of pollution to take place in the river water the nearer one gets to the mouth. The analyses give us the following data:—

Chemical examination of water No. 1 shows it to be a clear, soft, potable water, with no large amount of pollution. The water contains a respectable quantity of vegetable organic matter, but this does not detract from its potable qualities. Bacteriological examination on the other hand shows a fairly large flora of bacteria, containing organisms indicative of surface drainage, and when using large quantities it is possible to extract organisms of the colon group which are, with others, proof of pollution of intestinal origin. Although not showing an enormous amount of pollution it still proves that a slight amount does gain access to the water, therefore the possibilities of larger additions must always be borne in mind. Such a water could not be safely recommended for drinking purposes for the above reasons.

Water No. 2, chemically, shows a little difference from No. 1, in the fact of a small increase of the total solids. The material in the water seems to be partly organic, partly saline in nature. The change from No. 1 is not very marked, but although small, there is evidence to show that it has picked up some extra traces of organic matter in the short interval between the points where No. 1 and No. 2 were taken. Turning to the bacteriological examination of No. 2, we are struck by the fact that it contains more than twice the number of organisms than are contained in No. 1. The organisms, as shown in the report, are indicative of surface drainage, that is, the organisms are such as one gets in ordinary refuse. Another suggestive point is that numbers of the colon group of bacilli can be obtained from half the quantity of water which had to be used to procure them in No. 1. In brief, the evidence shows the addition of some pollution between points 1 and 2.

No. 3, chemically, shows the chief characteristics of river water, as in Nos. 1 and 2, but as in No. 2 points to the addition of a small quantity of organic matter, which seems to be of recent origin. Bacteriologically it provides an abundant flora of bacteria, slightly more marked than No. 2; the varieties are more numerous, and we also get organisms indicative of drainage.

No. 4 agrees in the main with No. 2, but there was a curious addition of a small quantity of animal organic matter. The remaining characters of the water are precisely the same in general as for the other three, namely, the general chemical characteristics of river water. Bacteriologically the number of colonies in the water are about the same as in No. 2, but there seems to be a greater variety of bacteria. The presence of surface organisms, including members of the colon group, is much about the same as in No. 2. One is forced to the conclusion though, in this case, that somewhere between the point of entry into the mains and the point of delivery at the tap, a very slight addition of polluted material has found its way.

Looking at these four waters generally, No. 1 shows up undoubtedly the best, and there is very little to choose between Nos. 2, 3 and 4. From the analytical results there is no hesitation about classifying waters No. 2, 3 and 4 as being undesirable for the purpose of a public water supply. I would point out with regard to No. 1, even that water ought not to be looked upon too favourably; that, considering all the evidence together, the water derived from the Kamanistiquia River is not to be thought of for purposes of a permanent and good water supply for the people of Fort William. The analyses also prove most conclusively that pollution does take place in the River Kamanistiquia, the pollution in all cases is quite recent and there can be no doubt about its powers of spreading disease. For, granted the entry of typhoid bacilli into such a river water, its chemical composition demonstrates what a favourable medium it would be for the growth and propagation of these bacteria. Seeing that waters No. 2, 3 and 4 do show evidences of pollution, no one could contend that this sewage pollution is not likely to contain typhoid bacilli, in view of the fact of typhoid fever having been present as isolated cases for some time past in Fort William and the vicinity; therefore, it is a moral certainty that these typhoid bacilli would find their way into the drinking water. Once these bacilli gain admission to the drinking water the risks of infection naturally become great. We have to think, not only of the amount of water that is actually drunk as such, but also its use in dairies and the preparation of food, etc. In my interim report I laid full stress upon this question and in laying down preventative measures for the suppression of the epidemic showed how necessary it was to thoroughly supervise and control the distribution of this water in the various ways above designated.

The present condition as set forth in the analyses of the Kamanistiquia water cannot continue for long, for, as the country along the river valley becomes more ad more settled, the conditions will become worse and worse and therefore the river cannot be available as a source of water supply in the future much less than it can be used now. This disposes of the Kamanistiquia River.

No. 5. Turning to the Neebing River, we see from the analytical reports that the nature of this water varies greatly from that of the Kamanistiquia River. It is harder, contains a trifle less of organic matter, but this organic matter comprises more animal material than does the Kamanistiquia. Of course this applies only to the points of the river where the sample was taken, it may vary much higher up to a considerable extent. Bacteriologically, the number of organisms is, if anything, a trifle less than at a corresponding point on the Kamanistiquia. The organisms of pollution, however, are present in about the same proportion as in No. 3, and as the report of No. 5 indicates clearly, this cannot be considered as a safe water to drink.

Turning to Nos. 6 and 7, being the waters from wells in the town, the question was asked by the city clerk in a letter to me, whether these waters could be available for distribution to the people, until such time as efficient water scheme could be installed. The analyses of the waters are very instructive. No. 7 water, chemically, shows a considerable excess of organic matter over No. 6; the remaining characters being those of well water, need not obscure the main question here. Bacteriologically, they show a far too numerous growth of organisms for deep well waters, No. 7 especially. The character of the organisms here are very suspicious, some of them being those which one meets with more on the surface, and it is very important to establish whether No. 7 is receiving superficial underground water in some form or other. As I am not acquainted with the well I do not know whether it is superficial or deep. If it were superficial it shows that the superficial ground water is gaining access to it and is therefore undesirable; if deep, there is some communication between the superficial and deep ground waters, which is equally undesirable. This may be due to a faulty pipe, or to a communication in the ground itself, instances of both being fairly common.

No. 6 is the more safe water of the two, but here again I do not like the excessive bacterial growth, and although no dangerous organisms were actually found, still I do not feel in a position to recommend it strongly.

As a final verdict I should give it as my opinion that the best course to pursue would be to depend largely on filtered water by the Berkefeld filter. In that you have an absolute safeguard against bacterial infection of any kind, and if you provide a few of the larger kinds for public service at convenient points you ought to be able to produce enough filtered water for drinking and culinary purposes. This condition of affairs could only be purely temporary and must necessarily mean a shortage of water for the time being, at the same time showing how important and necessary it is to instal a safe water supply as soon as possible.

This brings me to the consideration of schemes for a public water supply. I have taken all the conditions of Fort William into careful consideration and as a result have come to the conclusion that only two schemes are possible. It must not be forgotten that whatever process or method is adopted it must be one which shall secure to Fort William an absolutely pure, efficient and plentiful supply of water for all time to come. The two schemes are: (1) The employment of Loch Lomond and (2) a filtration plant. I have gone through many points in connection with each and will lay before you the results of my deliberations in order that you may be guided in your resolutions as to which would be the more profitable and more quickly accomplished.

1st. The Loch Lomond Scheme:—The cost of this I do not know, but you are in possession of the plans and estimates for such a scheme. The water of Loch Lomond is derived by drainage from the surface of the surrounding country, that being so it is obvious that the surrounding country, comprising the watershed of Loch Lomond, must be entirely under your control with a view to preventing any possible pollution of the lake water. Unless you can get powers to obtain this control, in order that you may carefully guard the collecting area, this source of water supply will not be safe in the future, for undoubtedly settlements, one kind or another, camps, pleasure parties, etc., will take place in the Lake Lomond region and thereby contaminate the water. However, if you can obtain such control and can efficiently guard the collecting area, then Loch Lomond would be an absolutely safe source of water supply for the town. As I said before, I do not know the cost of this, but it must be fairly considerable.

2nd. The Filtration Scheme:—A sand filter plant constructed to turn out a million gallons per day would more than meet all the requirements which Fort William could make upon it. It would allow of a considerable increase of the present population, almost double its number, and still give a large and copious water supply. I have ascertained some figures for your guidance here. A covered sand filter, capable of turning out a million gallons per day, including all the necessary piping at the plant and intake, all the apparatus, such as pumps, etc.,—in fact a completely equipped plant—would cost, at the very ouside, not more than $50,000. It could be constructed within a few months and would give you a permanent supply for all time, which could be increased, if in future years Fort William grew to be a very large town, at a very small cost. Perhaps the best way of putting it to you would be as follows:

The initial cost would naturally be defrayed by a loan; reckoning upon the above particulars of a completely equipped sand filter, giving one million gallons per day and costing something less than $50,000, we may say that the maintenance of the plant, the cost of the operation, the interest on the loan and a forty years' sinking fund, would be well covered by a rate of three or four cents per month per consumer. I do not know whether these statements will help you or not in coming to a decision, but you may safely reckon upon the above estimates, and it is more than likely that the actual working out of the expenditure, etc., will come less than I have quoted.

In the case of filtration plant I should strongly advise the water to be taken from Lake Superior at a point some two or three miles below the Town of Fort William and having filtered water pumped to the town.

As I have remarked already, both these schemes are good, subject to the remarks that I have passed upon them. It is for you to decide of course which will pay you best and doubtless the rapidity with which either one can be constructed and so have a town supply of good and safe water, will be a very powerful factor in enabling you to come to a decision. If by chance you favor sand bed filtration, let me impress upon you the advice to have nothing but a sand bed filter; do not be deluded by statements which appear in newspapers recommending the use of a mechanical pressure filter: my advice to you is they are not safe and are nothing like as efficient and durable as a sand bed filter. You may perhaps be approached by engineers, etc., with very plausible arguments as regards the difference in first cost applicable to each kind of filter, but though the first cost of a mechanical filter is somewhat less than a sand bed filter, you may take it from me that it does not pay in the long run, besides having a less pure water.

Lastly should you consider the question of sand bed filtration, do get the advice of a good consulting engineer who is thoroughly conversant with this particular kind of filtration bed. Knowing the urgent necessity and need of obtaing a pure water for the people, I am inclined more to the filtration system than I am to Loch Lomond, simply because the Loch Lomond scheme, although excellent, would take a longer time to construct. I have not one word to say against Loch Lomond as a source of water supply, otherwise I should not recommend it, but it certainly seems to me that it would take a year at least to get into working order, whereas the filtration scheme could be put through in a few months.

The site for the filtration plant could be in the vicinity of the intake, some two miles or more to the south of Fort William.

The Sewerage System:—The condition of the sewerage in Fort William at the present time is such as to call for urgent improvement. Owing to the nature of such sewers as are at present in use, the whole of the ground on which Fort William stands is practically sewage-logged. This is a menace to the public health, not only as at present obtains, by polluting drink water, both in the river and perhaps in the mains, but also the presence of a sewage-logged soil round the houses exerts a very decided harmful influence upon the health of the inhabitants. The plan of a proposed scheme of sewerage, which was shown me when I was in Fort William, I do not consider quite complete. With reference to laying drains on the streets I have no fault to find. The plan of drainage must obviously be governed by the lay of the land, and according to that aforesaid plan, the city was divided into nine sections. Of course this division could be overcome by lifting the sewage and so bringing it to one out-flow. The cost of lifting would not be very much and could be accomplished either by pumps or preferably by pneumatic ejectors. The part of the plan which I do object to is the treatment of the sewage before it is put into the river or lake. A system of septic tanks is recommended; this in itself is only half the sewage purification scheme. The effluent which comes from a single septic tank, although perfectly clear, is still very putrescible and capable of a large amount of decomposition, and I would advise a sewerage scheme which shall not only put the sewage through a septic tank, but treat it afterwards by aerating beds, or on land, whichever may be the most suitable.

As I impressed upon you at our meeting on March 4th, this sewerage question is also urgent and needs your immediate attention. With a proper water supply and a properly constructed sewerage system, the ground on which Fort William stands would not only be free from pollution by the sewage, etc., soaking into it, but the water mains would be safe from possible contamination by underground polluted water.

Before I left Fort William you asked my opinion as regards the possibility of the present water mains being infected, and since then I received a letter asking for the same information. From what I have said in the above remarks, and knowing that infection will not lie in the present water mains for any length of time, you will see that the answer to the question is to have a perfect water main, and not an imperfect one as at present exists, the sewage-logged ground must be cleared of its sewage and filth. To my mind it is not the infection that is in the pipes lying there, so to speak, but the infection that is daily gaining access to the pipes in one way or another.

Under the heading of sewage, I must treat of the privy system which obtains to a large extent in Fort William. The sooner you get rid of the privy system the better it will be. The "hole in the ground" is always a menace to health directly, and indirectly, through soaking the surrounding soil with a large amount of putrescible matter. I do not offer any scheme or advice to palliate these, but tell you only to get rid of them as quickly as possible. With your new sewerage system you can install the water-carriage system with proper water closets, etc., and you can do this without extra expense to the town, seeing that all owners of houses can be compelled to conect up to the public sewer when it comes within reach of the owner's house; the connecting up and all the sanitary fittings on his premises are paid for by the owner and not by the town. The clearing out of these privies I need not remind you is obviously a danger and a nuisance combined.

Garbage. The garbage question is another point on which you asked
an opinion of me. The proper method of managing garbage can be divided into two parts: first, the efficient storage and collection on the house prem-
an opinion of me. The proper method of managing garbage can be divided into two parts; first, the efficient storage and collection on the house premises. The Health Department, by means of its inspectors, ought to see that this is done in every house without distinction. The best receptacle for dry refuse from any house for a period of three or four days or more. If properly stored in this way the garbage is prevented from flying about the yard. Some of the garbage may be of a decomposable nature, some of it may be of an infectious nature, in both of which instances it is very necessary to keep it enclosed within a proper water-tight receptacle which latter can be efficiently cleansed and disinfected as occasion requires. The use of brick bins, barrels and boxes must not be allowed for the reasons just stated.

As regards the collection and the disposal of garbage, this is the duty of the municipal department. Properly constructed refuse carts are all that is necessary for its removal. Visits should be made once a week, preferably twice a week, to each house for the purpose of garbage removal. The disposal of the garbage is undoubtedly best accomplished by incineration or destruction. The incineration method has the great advantage in that we can place the plant anywhere within the town limits as may be best convenient. There is no nuisance, no danger to the public health from such a plant when properly constructed and worked. As an extra inducement it may be pointed out that such a plant may earn a little money for itself and thus partially defray expenses. But do not start an incineration plant with the idea of making the plant pay for itself; it is a wrong policy and only in a few exceptional instances has such a plant ever been made to be self-supporting. The prime object and duty is to destroy the garbage, and if by any use of by-products money can be made, well and good.

The best incinerator which I know of, and which I can strongly recommend to you, having had considerable experience with these things, is one made by Horsfall and Company, of Leeds, England; another very good firm is Meldrum and Company, Timperley, near Manchester, England.

The Health Department. Lastly, I must not omit mention of the organization of your Health Department. The Town of Fort William has now reached such a size, and the sanitary condition and the sanitary undertakings which you are at present contemplating, call for an efficient health department in order that none of the various improvements may break down through lack of attention from the proper quarter. It is necessary for you to have much more of your Medical Officer of Health's time than you have at present, and you should arrange accordingly for this to be done. The Sanitary Inspector's department is also a very important one, and you need at least one or two good sanitary inspectors. The duties of these officials it is not necessary for me to touch upon at the present time, but I would strongly call your attention to the fact that although you may apparently be involved in an increased expenditure for this department, it will pay you over and over again in the long run and you will save by an efficient department much more money per annum than you will expend in salaries. In this way you will be making an actual saving. The sanitary condition of the town comprising both houses and areas round houses, together with inspection and supervision of dairies and milk supplies, prevention of overcrowding, notification and investigation of outbreaks of infectious disease, lighting, heating, and ventilating, school inspection—all demand urgent attention, and I do not see how you can carry on the direction of Fort William's affairs with a view to safeguarding the health and welfare of the public without a fully equipped and well-organized health department. Hygienically speaking, Fort William is placed in a healthy position, healthy surroundings, and needs only competent direction and supervision to be one of the healthiest places in Canada.

A health department has a great deal to do in the supervision of lodging and boarding houses in a town, and all these places ought to be licensed, and you ought to have sound and equitable by-laws governing these places, especially with a view to preventing bad sanitary fittings, bad ventilation, over-crowding, and the spread of infectious disease. Being aware of the cosmopolitan nature of the working section in certain parts of the town, these regulations *re* better equipment of the health department are extremely important.

Finally, I feel sure of a considerable reduction of all kinds of infectious disease, including the simple sore throat which is so often engendered and favored by the presence of a soil soaked with filth, which may very often contain infectious organisms.

In conclusion, I may say how pleased I should be to offer any suggestions to you in the way of reorganization or improvements connected with the sanitary department of your town. I trust that this report is quite clear and explicit; if, however, there are any points requiring further explanation, you need only write to me to obtain such.

APPENDIX.

Bacteriological and Chemical Analysis of Water Examined.

SAMPLE NO. 1.

Chemical Analysis:

Total solids	4.
Fixed solids	0 = marked charring.
Volatile solids	4.
Free ammonia	.00075.
Albuminoid ammonia	.0222.
Chlorine	.1.
Hardness	9.1.
Nitrates	.0072.
Nitrites	.01.
Phosphates	Faint trace.
Sulphates	Nil.
Metals	Ca = very faint trace.
“	Mg = trace.
Oxygen absorbed	1.0545.
Alkalinity, as Na_2 Co_3	2.438.

Bacteriological Analysis.—The average number of colonies in 1cc. plated on gelatin was 2,600, very few of which were liquefying; there were no moulds. On agar in 1cc. the average colonies numbered 276.

Qualitative Examination.—The colon bacillus was extracted from 100cc. of water and isolated; no streptococci found, no Klein's bacillus; the other organisms were, the bacillus subtilis, bacillus albus, bacillus auranticus, proteus and micro-coccus albus.

Opinion.—This water is chemically a fairly pure one containing well marked traces of vegetable organic matter, soft, and possessing all the characteristics for domestic use. There is, however, evidence from the above chemical results to show that there is some slight trace of animal organic matter gaining access to it.

Turning to the bacteriological results here again the sum total evidence points to some slight contamination with animal organic matter, by virtue of the large quantities which have to be used for the extraction of the colon bacilli and other members representing surface drainage, such as proteus, for instance. Although no pathogenic organisms of any great note were isolated, still the potentialities of this water have to be taken into consideration. The fact that there is small pollution assures us of the possibility or even probability of this pollution becoming excessive at some time or other. Besides this the chemical composition of the water is such as to provide a good growing ground for organisms, and therefore in case of bacterial infection we should expect these infectious bacteria to propagate themselves very readily.

For these reasons I do not consider No. 1 fit to be recommended for drinking purposes, not because it contains many dangerous organisms at the present time, but because it shows its possibility of doing so.

SAMPLE NO. 2.

Chemical Analysis:

Total solids	10.
Fixed solids	5 = marked charring.
Volatile solids	5.
Free ammonia	.0005.
Albuminoid ammonia	.0191.
Chlorine	.1.
Hardness	8.8.
Nitrates	.0072.
Nitrites	.01.
Phosphates	Trace.
Sulphates	Nil.
Metals	Ca = very faint trace.
“	Mg = trace.
Oxygen absorbed	1.185.
Alkalinity, as Na_2 Co_3	4.929.

Bacteriological Analysis.—The average number of colonies in 1cc. on gelatin was 7,500, a very large number of which are liquefying; the average number on agar in 1cc was 848.

Qualitative Examination.—Colon bacilli were isolated fairly easily from 50cc. of the water, one or two colonies of the streptococcus were found, but no Klein's bacilli. The other organisims were the bacillus subtilis, the bacillus mesentericus, bacillus albus, proteus vulgaris.

Opinion.—This water, as compared with No. 1, shows in the first place a slight increase of total solids, part of them being mineral, part organic. The quality of the water is much the same as No. 1, except that it shows an addition of organic matter, and, therefore, even a better growing medium for bacteria.

Bacteriologically one is struck by the increased number of organisms per cc. as compared with No. 1, showing most conclusively the addition of these somewhere in the distance that this water has travelled between points No. 1 and 2. The character of the organisms is more indicative of surface drainage than those contained in No. 1; the large proportion of liquefying colonies to the sum total also being another important point bearing on this question.

Briefly, we may sum up by saying that water No. 2 is not to be recommended for drinking purposes, much less than No. 1.

SAMPLE NO. 3.

Chemical Analysis:

Total solids	6.4
Fixed solids	0.6 = marked charring.
Volatile solids	5.8.
Free ammonia	.0011.
Albuminoid ammonia	.02205.
Chlorine	.1.
Hardness	8.9.
Nitrates	.0072.
Nitrites	.01.
Phosphates	Trace.
Sulphates	Nil.
Metals	Ca = very faint trace.
“	Mg = trace.
Oxygen absorbed	.95.
Alkalinity, as Na_2 Co_3	4.876.

Bacteriological Analysis.—The average number of colonies in 1cc. on gelatin was 9,450, one-fifth of them liquefying; the average on agar in 1cc. was 864.

Qualitative Examination.—The colon bacilli were easily isolated from 50cc. of the water; streptococci were found, as also Klein's bacillus. The proteus vulgaris, bacillus mesentericus, bacillus subtilis, bacillus auranticus, bacillus albus and micrococcus albus.

Opinion.—The chemical examination points out very conclusively the addition of recent animal pollution in the form of albuminoid matter. The other characters are much the same as in No. 2, that is as regards the amount of vegetable matter and inorgnic salts, which are typical of that particular river water.

Bacteriologically there is a further slight increase of the total number of bacteria as compared with No. 2, but the important point is the number of liquefying organisms, the larger variety of surface organisms and the presence of others such as the colon, Klein's, streptococcus, proteus, etc., which are always found in sewage.

I have no hesitation in saying that this water ought not to be used for drinking purposes.

SAMPLE NO. 4.

Chemical Analysis:

Total solids	9.4.
Fixed solids	5.4 = marked charring.
Volatile solids	4.0.
Free ammonia	.00075.
Albuminoid ammonia	.03675.
Chlorine	.13.
Hardness	8.6.
Nitrates	.0080.
Nitrites	.01.
Phosphates	Well marked trace.
Sulphates	Nil.
Metals	Ca = very faint trace.
“	Mg = trace.
Oxygen absorbed	.9785.
Alkalinity, as Na_2 Co_3	4.611.

Bacteriological Analysis.—The average number of colonies per cc. on gelatin was 8,100, one-tenth of which were liquefying; on agar per cc. 860.

Qualitative Examination.—The colon bacilli were isolated from 50cc. of the water with comparative ease; streptococcus, a few colonies; bacillus subtilis, bacillus mesentericus, proteus vulgaris, bacillus auranticus, bacillus ochraceous and bacillus albus; Klein's bacilli not found.

Opinion.—In most respects the chemical characters of this water are typical of the river water, as in Nos. 1, 2, and 3. There is an interesting point, however, as regards the slight increase of the albuminoid matter as compared with No. 2. This is supposed to be the same water as No. 2, except that it has run through a series of water mains. There is evidently some leakage or contamination in the pipes to account for this slight increase.

Bacteriologically the flora varies a little from No. 2, in the fact of them being, if anything, slightly more numerous. The nature of the organisms found proves the presence of surface pollution, and therefore this water must be passed as unfit for consumption.

SAMPLE No. 5.

Chemical Analysis:

Total solids	19.6.
Fixed solids	11.0=moderate charring.
Volatile solids	8.6.
Phosphates	Faint trace.
Free ammonia	.01135.
Albuminoid ammonia	.0161.
Chlorine	.85.
Hardness	19.9.
Nitrates	.003.
Nitrites	.01.
Sulphates	Very faint trace.
Metals	Ca=very faint trace.
"	Mg=moderate trace.
"	Fe=trace.
Oxygen absorbed	.393.
Alkalinity, as $Na_2 Co_3$	12.773.

Bacteriological Analysis.—The average number of colonies per cc. on gelatin, 1,360, one-fifth liquefying; on agar per cc. 394.

Qualitative Examination.—Colon bacilli easily isolated from 50cc. of water; moulds, the bacillus subtilis, the bacillus mesentericus, streptococcus, proteus, the bacillus auranticus, staphylococci, all found.

Opinion.—The characters of this water chemically differ remarkably from Nos. 1, 2, 3, and 4; it is a much harder water, does not contain the same amount of vegetable organic matter, and the evidence of animal pollution is very marked, and points to it being quite recent.

Bacteriologically the number of organisms is not so numerous as in Nos. 1, 2, 3, and 4, but the proportion of liquefying organisms and the presence of such a number indicating surface pollution are such as condemn this water straight away.

SAMPLE No. 6.

Chemical Analysis:

Total solids	95.6.
Fixed solids	78.6=no charring.
Volatile solids	17.0.
Free ammonia	.02835.
Albuminoid ammonia	.00485.
Chlorine	43.5.
Hardness	34.8.
Nitrates	Nil.
Nitrites	Nil.
Sulphates	Trace.
Phosphates	Nil.
Metals	Ca=faint trace.
"	Mg=heavy.
"	Fe=faint trace.
Oxygen absorbed	.082.
Alkalinity, as $Na_2 Co_3$	5.989.

Bacteriological Analysis.—The average number of colonies per cc. on gelatin was 1,764, about five per cent liquefying; on agar per cc. 760.

Qualitative Examination.—The colon bacilli not found, the bacillus albus, bacillus mesentericus and proteus, bacillus ochraceous and micrococcus albus present.

Opinion.—The character of this water, chemically, point to a deep well water in the fact that it contains a very large amount of solid material, chiefly of inorganic kinds; there is very litle organic material present. The analysis shows that this water has been apparently in contact with animal organic matter at some previous stage, how far off or how remote I cannot say, but it is certainly not recent. It is not a very useful water for domestic purposes, being too hard.

Bacteriologically the number of organisms present is quite beyond what one ought to find in a deep well water; some of them, particularly the subtilis and proteus groups are indicative of some communication between the water on the surface and that in the well. Although none of these organisms are dangerous in themselves, in fact, there is not one dangerous one in the whole list, still, both the chemical and the bacteriological analyses point to some extraordinary previous contamination. It is for this reason that I do not like to recommend, off-hand, water No. 6 for drinking purposes. Before finally condemning it, however, I think it would be advisable to examine the water again on one or two different occasions, after having the well and piping thoroughly examined to see that there is no communication between the surface water and the deep water.

Sample No. 7.

Chemical Analysis:

Total solids	125.4.
Fixed solids	77.6 = slight charring.
Volatile solids	47.8.
Free ammonia	.0283.
Albuminoid ammonia	.0176.
Chlorine	60.0
Hardness	58.4.
Nitrates	Nil.
Nitrites	Nil.
Phosphates	Faint trace.
Sulphates	Nil.
Metals	Ca = trace.
"	Mg = heavy.
"	Fe = trace.
Oxygen absorbed	.2645.
Alkalinity, as Na_2Co_3	10.282.

Bacteriological Analysis.—The average colonies for 1cc. on gelatin was 7,700, one-tenth liquefying, the average per cc. on agar 1,200.

Qualitative Examination.—No colon bacilli were isolated but members of the colon group were detected in quantities of 100cc. and in one case a bacillus having all the characters of Gartner's bacillus was isolated. The proetus vulgaris, the bacillus albus, the micrococcus albus and the bacillus roseus were found.

Opinion.—The chemical analysis shows this to be a very hard water indeed, much too hard for domestic purposes; it shows very marked traces of organic matter, chiefly of an animal type. The contamination seems also to be fairly recent, and in my opinion is undoubtedly derived from the sewage-contaminated underground water which lies beneath Fort William.

The nature of the organisms in the bacteriological reports simply adds weight to this opinion, being sewage organisms and in great abundance, especially considering that this water comes from a well. This water ought not to be used for drinking purposes of any kind.

Report on Typhoid Fever and Sanitary Conditions of Sault Ste. Marie.

By Drs. HODGETTS AND BELL.

The Town of Sault Ste Marie has for a number of years past, added its quota of cases of typhoid fever to the provincial total, and in 1902 a report on the outbreak of that year was presented to the board by one of your reporters, see page annual report. It was the expected the local authorities would profit by that report, and insist upon the enforcement of proper sanitary precautions, but that reporter regrets to state there is little evidence of such being the case.

Typhoid fever being chiefly a water borne disease, one is led to wonder how it is this town having ready access to the waters of Lake Superior, the largest, and one of the best purest bodies of fresh water in the world should be thus afflicted.

Within the area of the two municipalities, Sault Ste. Marie and Steelton, there are possibly now living 10,000 persons, constituting what may be styled the "Greater Soo." Steelton has a very scattered population which is subdivided into four separate groupings, the chief of which are Tagona and Steelton proper.

The municipality of Sault Ste. Marie some years ago entered into an agreement with the Tagona Power and Light Company for a public water supply for domestic and fire purposes, and the company furnishes water at a given rate per thousand gallons at, we believe, a minimum pressure of 60 lbs. This system was, we believe, installed without the approval of the Provincial Board of Health and contrary to the provisions of section 30 of the Public Heath Act.

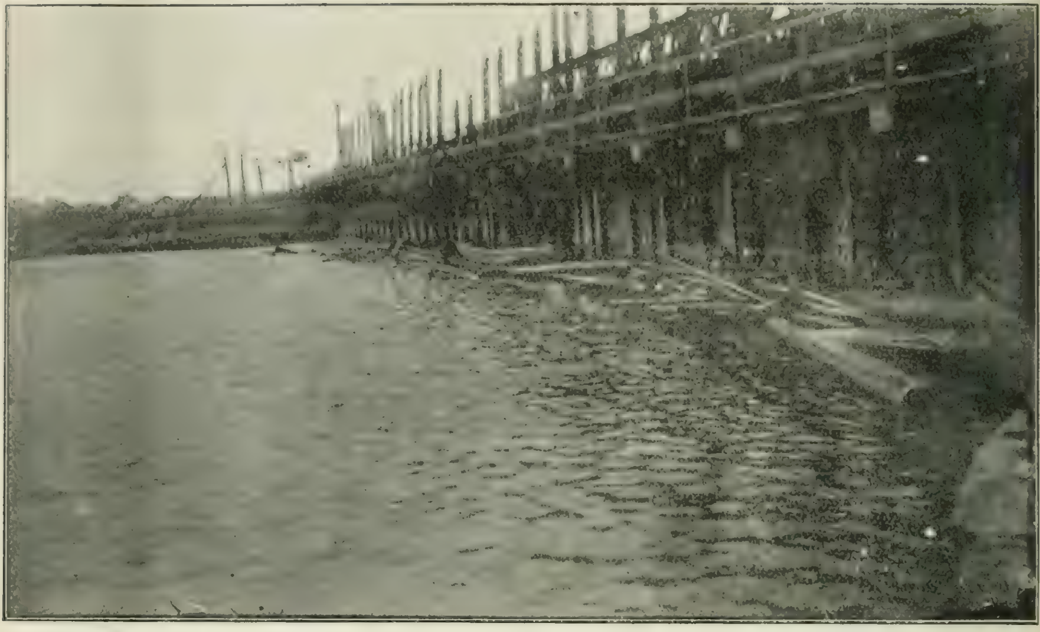
Again, the District of Steelton adjacent to the steel plant is supplied by water pumped by the same company, altogether a separate system from that of the Soo, also unapproved by the Provincial Board of Health. It will, therefore, be seen that with the exception of Tagona, the inhabitants of Steelton must derive their water supply from either wells or springs.

Then as to the sewage disposal, the Town of the Soo installed a system under the supervision of Mr. Chipman, C. E., some few years ago, the effluent being discharged into the river below the rapids and ship and power canals. Tagona was sewered by this company when laid out, and the effluent is discharged into a trunk sewer running from the steel plant, to a point near the junction of Superior and Huron Streets, in the Town of Sault Ste. Marie, on property owned by this company, from which point it runs in an open sewer, again a company property, to the Fort Creek at a point south of Superior St., and east of John St., thence finding its way into the river. This latter system was so far as we can learn never approved of by the Provincial Board as required by section 30 of the Public Health Act.

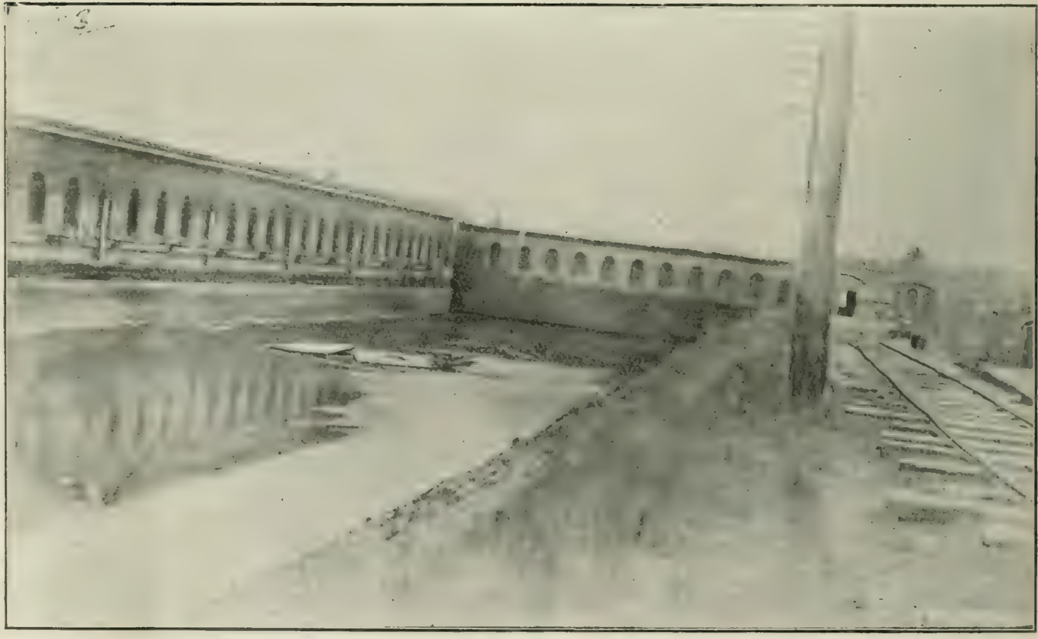
With this exception the municipality of Steelton is unsewered and no satisfactory provision is made for the collection of domestic waste, each householder working, when he works at all, apparently on the principle of preventing the pollution of his own premises, and caring little for their neighbors—and here we would state this applies to many of the premises of the Town of Sault Ste. Marie with greater force than to that known as "Little Italy," where a foreign population has been left to their own (?) will as to water supply, privy construction and garbage disposal with the result that there is considerable surface pollution.

With these very necessary outlines of the complicated conditions as to water supply and sewage disposal, we would now beg to report on the typhoid outbreak of the present year.

In order to make a thorough examination, we were very kindly furnished a list of all cases by Dr. McCaig, M. H. O., who previous to our visit had secured from the physicians of the town a full list of cases as treated by each The total number reported were as follows: 236, which we classify as resident and non-resident, and we again sub-divide the town into "The Soo," and Steelton, as the latter municipality having no resident physician looks to the physicians of the former for medical aid, and the non-resident are sub-divide into camps and other municipalities.



Upper side of screen at head of Power Canal, showing accumulation of rubbish through which town supply of water flows.—Sault Ste. Marie.



Power Canal.—Water low, showing source of water supply.—Sault Ste. Marie.

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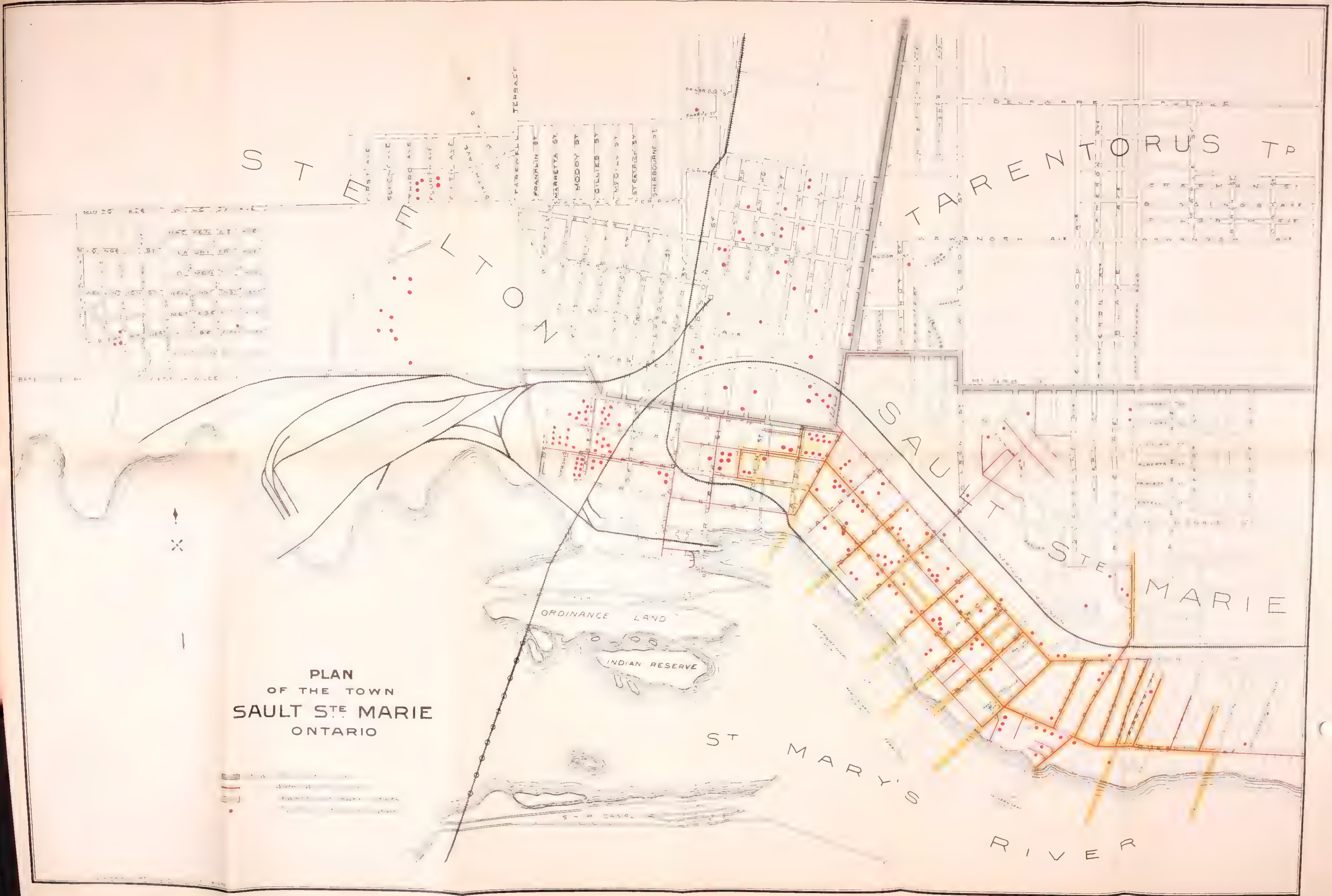


PLAN
OF THE TOWN
SAULT STE. MARIE
ONTARIO

Resident	Soo	122
	Steelton	52
Non-Resident	Camps	46
	Other municipalities	16

The practice followed out in this investigation was to make a visit to the house where the correct address could be ascertained and carefully examine into the sanitary conditions of the premises—of the hospital list, one of your reporters went over the same with a representative of the sisterhood, and when the patients were still in the hospital personally interrogated them as to residence, etc.

Cases Reported by the M. H. O. for August, September and to 22nd of October.

Soo	122
Steelton	52
Lumber Camps, etc	46
Other Municipalities	16
	236

Of these were treated in the General Hospital about 125, and at their own homes 111. At the date of visit, November 3rd, there were in hospital 36 cases. Since October 22nd, there have been reported about 15 cases.

A visit was made between November 3rd and 8th to as many houses as possible where cases had originated to gain information, etc., with following results:—

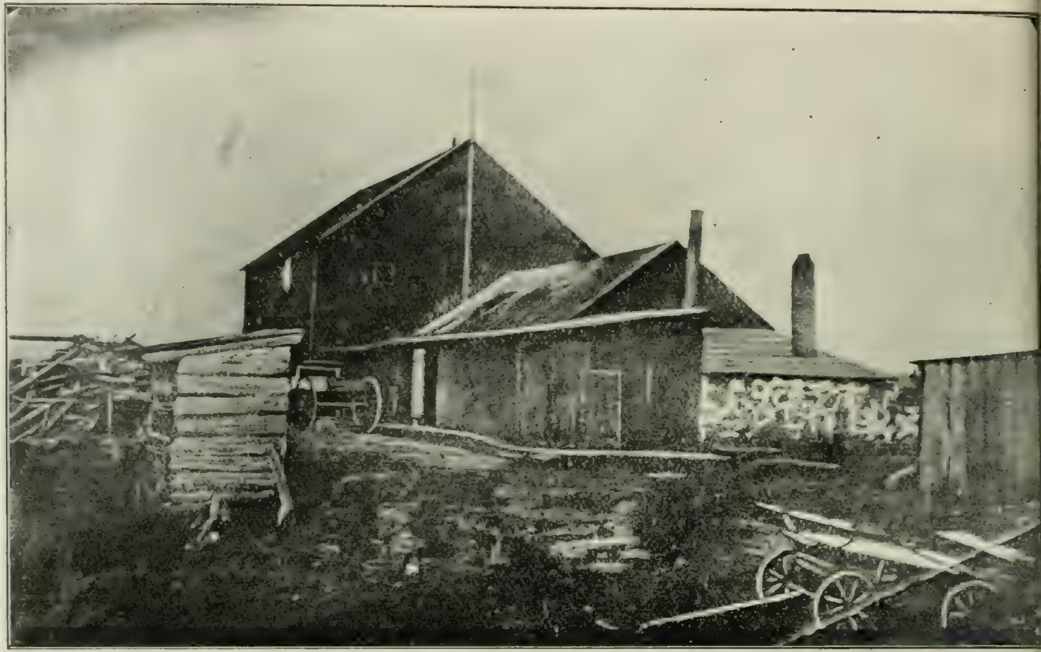
	Houses visited.	Cases.
Soo	80	102
Steelton	44	53
	124	155

——	Adult males.	Adult females.	Children.
Soo	68	20	14
Steelton	38	11	4
	106	31	18

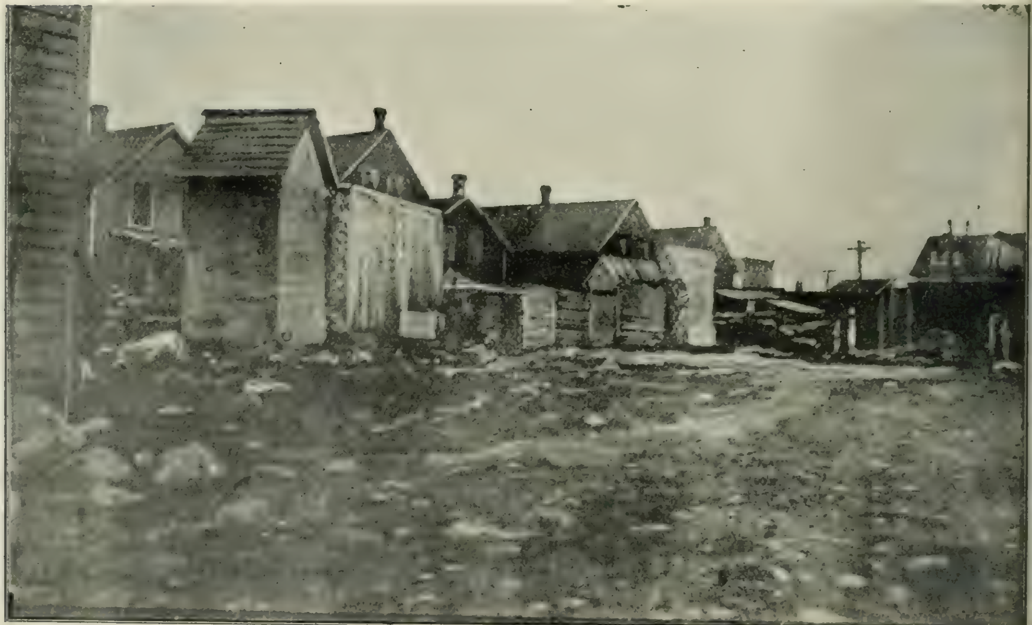
Water supply for these houses was obtained from,—

——	Town.	Steel Plant.	Wells and springs.	Creeks.
Soo	70	....	9	....
Steelton	10	8	20	4
	80	8	29	4

It is only fair, however, to here state that many of the patients rarely drank water at home, but drank freely at the Steel plant, and others at various places.



Showing bakery, stable, sleeping apartments and closet.—"Little Italy," Sault Ste. Marie.



Showing location of wells and closets.—"Little Italy," Sault Ste. Marie.

The milk supply of these 124 houses visited was obtained from 39 different dealers, and one of these dealers got milk from many sources and mixed it before retailing.

Only 30 of the houses visited have cellars and several of these were continually damp or wet. The remaining 90 were mostly on low damp ground, where almost impossible to have a dry cellar.

Twenty-five had sewer connections, but several only for the sink and kitchen water, not from bath or closet, the remaining 100 nearly all had small surface drains from the back yards to the street drains, and into these went all the slop water of the premises, over 100 of these being box or very shallow pits, and no dry earth used.

In addition to the cases mentioned, we visited an Italian Colony known as "Little Italy," situated in the western end of the Soo and bordering on Steelton. Here there were over 30 cases of typhoid, not included in those above given as visited, as it is impossible to individualize in these cases.

This colony is crowded into a lot of miserable shacks, filthy both outside and in, no cellars, no drainage, closets on surface of ground vile beyond description, water mostly from shallow wells which were dirty and unfit for use, most of them located within a few feet of the closets.

In this section we also visited four bakeries, where the work was carried on under the most unsanitary conditions, bake-shop, stable, sleeping apartments, all adjoining and under one roof with manure and other filth about the doors being tramped out and into the bake-rooms, some of which were so dark they had to be lighted by lamps during the day.

We would point out that some of these "Little Italy," residents were employed at the Steel plant, and while there, doubtless drank of the water supplied by that system, although when at home "drank of the water of the wells of that place," reference to which will be made later—thus having a choice of two evils, which being the greater, your reporter cannot state positively.

As to the causes of the continuance of typhoid fever in the district covered in our report, there are several, each and all of which should be remedied forthwith by the municipalities concerned, otherwise this year's experience wil be repeated in 1908 with possibly more serious results.

They are briefly as follows:—

(1) The situation of the intakes of the Steel plant, water supply in what cannot help but be a polluted source for many months each year.

(2) The present intake of the Soo supply in the power canal where contamination is possible at any time, and probably daily during the season of navigation.

(3) The many shallow polluted wells.

(4) The unprotected springs and streams.

(5) The cess-pools and box closets which at certain times, and in some instances all the time pollute wells or springs and,

(6) The open ditches leading from back yards often directly from closets across private lots into public streets where large open ditches exist carrying filthy sewage and domestic waste into sewage gratings, or is left to soak away in low lying land in which cattle, dogs, cats and fowl roam at large.

(7) The insanitary condition in which many of the citizens keep their premises, whereby vegetable matter, domestic waste, etc., is allowed to collect on private property, and which is aggravated by the filthy practice of throwing out in the yards, or in the lanes or streets slops, and other domestic liquid waste.

The conditions found by us to exist as stated in 6 and 7 may be the cause of the disease spreading by reason of—

(8) Flies—which attracted by the unsanitary mess have every opportunity to carry infection into adjoining houses particularly in respect to children. There was noticed in the immediate vicinity of houses where children had suffered from typhoid that infected human excreta could have found its way from adjoining closets of houses in which cases had preceded theirs, there being every opportunity for the little one to play in what were virtually open and contaminated ditches. In this connection we would point out that enquiry elicited the fact that in too many instances the disinfection of excreta was an unsatisfactory act, even while the patient was ill, and there was no evidence to show physicians instructed patients to disinfect for some time after recovery. This is particularly important from the fact that a recovered typhoid may be a manufactory for the bacillus of typhoid for many months thereafter.

(9) The undoubted pollution of the water used by some of the dairymen. We were not able to visit all the farms from which milk reached the two towns, so cannot, and do not, mean this to refer to all those who add their quota to the milk supply.

(10) The ice supply—in our opinion was not taken at a point in the river remote from the possibility of contamination, and to avoid even the shadow of suspicion the municipal authorities should immediately define the area within which this season's ice supply should be cut, and this point should be up the river about the rapids beyond all possibility of contamination.

(11) The remaining factor to be mentioned is that of personal carelessness in the management of cases treated at their homes either for a short portion of their attack before removal to the hospital—during their entire illness when not so removed, or during the period of convalescence when antiseptic precautions are relaxed or omitted altogether. We would particularly point out the great importance of the observance of antiseptic precautions by those in attendance upon typhoid cases, from the onset too late in the period of canvalescence, particularly as regards the thorough disinfection of all excrementious matter as we find this is in most cases even in hospitals performed in a most perfunctory manner, and physicians and health officers more particularly should be particular in the instruction of both amateur and professional nurses in this regard.

In conclusion we cannot too strongly urge upon the authorities of Sault Ste. Marie, the securing at as early a date as possible of—

First. A pure water supply.

Second. The enforcement of house connections with the sewers now constructed.

Third. Abolition of privy pits and box closets where sewage connections are possible.

Fourth. The introduction of regulations in respect to dry earth closets, when for tangible reasons the third recommendation is impossible.

Fifth. The establishment of garbage disposal by incinerator.

Sixth. The closing of all wells within the area supplied by the town system when a source has been obtained which in the opinion of this board is free from contamination.

Seventh. The periodic inspection of all wells or springs outside this area, and the closing of the same when found to be contaminated.

Eighth. A more careful oversight over the town's milk supply.

Ninth. A licensing and inspection of all boarding houses to prevent over-crowding, etc.

Sault Ste. Marie Waters.

Bacterial Report.

Laboratory Numbers.	Date, 1906.	Where collected from.	Streptococco.	Staphylococci.	Colon bacilli.	Colonoid bacilli.	Chlorine in parts per million.
7,254	October 19....	Municipal Buildings................	—	—	—	—	2
7,255	" 19....	Breen's Hotel tap		—	—	—	2
7,256	" 19....	Spring	—	+	+	—	2
7,257	" 19....	Spring	—	—	—	—	2
7,296	" 22....	Dr. McC.'s tap	—	—	—	—	1
7,297	" 22....	Templeton stable	—	—	—	—	2
7,390	" 24....	Head race	—	—	+	—	1
7,391	" 24....	Town water........................	—	—	—	—	2
7,472	" 29....	Lambert well.......................	—	—	—	—	69
7,473	" 29....	McAllister well	—	—	+	—	13
7,537	" 31....	3 Town water......................	—	—	+	—	1
7,538	" 31....	4 "	—	—	+	—	1
7,580	November 1...	Ice water	—	—	+	—	2
7,581	" 1...	Ice water	—	—	+	—	2
7,633	" 3...	Spring, W. Wismer.................	—	—	—	—	2
7,634	" 3...	Town water........................	—	—	—	—	2
7,746	" 7...	Davison's Creek...................	—	—	+	—	2
7,747	" 7...	St. Mary River....................	—	—	+	—	2
7,748	" 7...	"	—	—	—	—	2
7,749	" 7...	Town water........................	—	—	—	—	2

Recommendation of Grand Jury to His Honor Judge Teetzel in connection with outbreak of Typhoid Fever at Sault Ste. Marie.

The following extract from the report of the Grand Jury is of interest as showing the feeling prevailing in this section of the Province as to the inefficiency of local health authorities as at present constituted, and is given as their opinion of the necessity for some better system than that of local boards of health, and substituting therefor county or district boards of health.

7. The attention of the jury has been called to an epidemic of typhoid fever which exists in the Town of Sault Ste. Marie. It is said that the most common sight on the streets of the town is the ambulance conveying patients to the hospital. A large number of deaths are reported from this cause and the disease shows no signs of abatement. It appears that the supplying of the town with water is in the hands of a company which holds a franchise for this purpose from the town. It is contended on behalf of the town that the company has not carried out the provisions of the agreement concerning the place where the intake pipe should be situated, while the company hold a contrary view. The dispute has existed for a number of years without any apparent remedy. Meanwhile the town is subjected to epidemics of fever, with accompanying deaths and financial loss.

A similar state of affairs seems to exist in many municipalities, and it seems to be a general opinion that our present Public Health Act does not seem to meet the requirements, owing to the fact that not sufficient interest is manifested by the local municipal authorities. We would humbly suggest, therefore, that the Health Act should be so amended as to abolish the local boards of health entirely, take away municipal control and place the whole machinery of the law in the provincial board. The practical end of this suggestion was abundantly manifested during the smallpox outbreaks of 1901 and 1902 when the local boards proved themselves, in a great majority of cases, utterly unable to cope with the matter, and the provincial board was forced to take the question in hand, with the result that the pest was practically stamped out in a comparatively short time.

Laboratory Reports

By J. A. AMYOT, M.D

Presented at the Quarterly Meeting Held November 14th, 15th and 16th, 1906.

To the Provincial Board of Health of Ontario:

GENTLEMEN,—I have the honor to present you the following report of the work done and completed in your laboratories during the quarter ending Sept. 30th, 1906.

Table showing Number of Routine Specimens Examined under Special Denominations during Quarter ending September 30th, 1906.

Months of quarter. 1906.	Diphtheritic Swabs				Tuberculous Sputa		Typhoid Bloods.		Miscellaneous specimens.	Waters.		Total number for month.
	Release		Diagnosis							Chemical.	Bacterial.	
	+	—	+	—	+	—	+	—				
July	45	34	239	263	64	107	34	67	24	19	122	1,018
August	44	19	147	166	48	83	45	82	54	10	116	814
September	18	15	115	80	63	82	110	105	17	22	318	945
	107	68	501	509	175	272	189	254	95	51	556	2,777
	175		1,010		447		443			607		
	1,185											

Diphtheritic swabs?...	1,185
Tuberculosis sputa?...	447
Typhoid bloods?......	443
Miscellaneous.........	95
Waters...............	607

The total number of routine specimens examined was 2,777 during the quarter. For 1899 there were examined 1,370 specimens. The demands on the laboratory have continuously increased since then. Last year 5,787 specimens were examined. Up to date this year 7,900 specimens have been examined.

The following table shows the municipalities from which specimens have been received and examined:

Report from Laboratories of Provincial Board of Health for Quarter ending September 30th, 1906.

County.	Municipalities.	Diphtheretic Swabs. Release.		Diphtheretic Swabs. Diagnosis.		Tuberculous Sputa.		Typhoid Bloods		Miscellaneous Specimens.	Waters. Chemical.	Waters. Bacterial.	Total number for quarter.
		—	—	+	—	–	—	+	—				
Algoma	8			1	1		1			3		14	20
Brant	16					3	4			3	12	3	25
Bruce	15	1			1	4	5	6	6				23
Carleton	4						3		5				8
Dufferin	1					1							1
Elgin	3				1		1					5	7
Essex	19	1				6	16	2	8	1		14	48
Frontenac	9	69	35	20	20	15	21	19	8	8		9	224
Grey	20	1	2	6	2	3	9	2	3	1			29
Haldimand	4			1			2		2				5
Haliburton	1				1			1					2
Halton	5					1	1	1	3				6
Hastings	23			3		6	16	3	6	2		3	39
Huron	13	1	1	2			3	4	6	1		3	21
Kent	9					4	12	1	1				18
Lambton	26	3	7	2	3	4	3	6	17	9		18	72
Lanark	9			1		3	3	2	3			2	14
Lenn. and Add.	16			2	3	4	7	9	8				33
Leeds and Gren.	18			2		7	8	11	5	4		7	44
Lincoln	10			3	5	3	6	3	6	1		13	40
Middlesex	10			3	3	2	1	3	2			4	18
Muskoka	4					2	5		1				8
Nipissing	12						4	1	2	9		30	46
Norfolk	12					4	8	7	4	6		3	32
North and Dur.	28			1	1	15	10	7	8	1		5	48
Ontario	13					6	10					1	17
Oxford	15				1	9	8	14	15	1		19	67
Parry Sound	11		2	4	3	2	4	10	15	2		17	59
Peel	5					1	3				1	1	6
Perth	8				1	1	1	1	4	1		5	14
Peterboro	10	2	1	2	1	3	10	1	1	2		9	32
Press. & Russell	6			1			1	3	2			2	9
Prince Edward	1								1		1		2
Rainy River	2				2							1	3
Renfrew	18	4	2	3	1	7	9	2	3	1			32
Simcoe	31			5	1	4	14	18	11	7		11	71
Stor., D. & G.	10					4	6		1	1			12
Thunder Bay	6			1	1		1	2		1		9	15
Victoria	10	1			1	2	3	1	2	1		3	14
Waterloo	16				2	7	10	2	1	2	29	31	84
Welland	4						1	4	9				14
Wellington	14	3	2	2	2	3	9	2	6			2	31
Wentworth	9	1		3	2	1	2	3	5		8	21	46
York	33	20	16	433	450	38	31	38	74	27		291	1,418
Totals		107	68	501	509	175	272	189	254	95	51	556	2.777

Arising out of the accompanying tables, I beg to draw attention especially to the:

(1) One hundred and twenty-four specimens of alcoholic beverages were examined for the License Department. Based on the results tabulated many convictions for violation of the liquor laws were made.

(2) A synopsis and paper on the results obtained in an investigation extending over a period of eighteen months in the study of the method of

poisoning and the results of breathing carbon monoxide in illuminating gas. This work was done by our chemist, Dr. Nasmith, assisted by Dr. Duncan Graham, our assistant bacteriologist of last year. It was carefully and faithfully done. Often it meant all night seances. Altogether an extreme amount of very exacting details.

The work of the laboratory consists of the routine examination of infectious materials, suspected infectious materials, water and sewage investigation of live sanitary questions, search for food adulterations and preservatives, the examination of drugs and patent medicines, the periodic investigation of the potency of vaccines and serum preparations and lately the examination of liquors for the License department.

Urine, stomach contents, tumors, ordinary clinical blood examinations, in other words materials concerning individuals and not public health are not examined as work of the laboratory, nor are materials of a strictly medico-legal character examined.

All of the regular work is done without charge to those sending specimens; but specimens are not received from any one not connected with the health machinery of the Province. To check the indiscriminate sending of water samples a nominal charge of $5.00 is charged for each sample to any one other than an officer of a Health Board or municipality in the Province.

The only regular outfits for the collection of specimens sent out by the department are for samples of water for chemical and bacteriological examination.

It is hoped in the near future to send outfits for suspected diphtheritic exudates.

For the four principal classes of materials examined "data cards" are sent out, which are required to be filled in and forwarded with each specimen. This is done in the case of water, diphtheretic, tuberculosis and typhoid samples.

The reports on the last named sorts of specimens are sent on special blank forms by mail. In case the specimens are positive in diphtheria for diagnosis, telegrams collect are sent as a matter of routine unless otherwise requested.

Specimens are received by express at any time from 9 a.m. to 6 p.m. Three mails are delivered to us each day. On public holidays and Sundays one of us comes to the laboratory to examine diphtheria specimens especially so that there will be the least delay possible in reporting on them. Special endeavor is made to get our results as rapidly as possible and to report on them as soon as possible also, and to this end our routine is arranged and our methods devised. We think we have now reached our limit with the help we have, and have had, during the last six months especially, to work away overtime practically every day. Again, in consequence of the increased work and the shorthandedness we have been obliged to touch only the most essential features of the substances to be examined. The results could be made more useful than heretofore if there were given us increased hands.

With the exception of blood serum we prepare all our own medium. Up to the present we have found it cheaper, but now using so much blood serum it would be cheaper to make it ourselves and will after the first of the year do this if possible. Our experimental animals are farmed out.

Our staff consists of a director-bacteriologist, a chemist, an assistant-bacteriologist and a boy.

To do the emergency work in the East there is a branch laboratory at Kingston in charge of a bacteriologist. During the last quarter there were examined by this branch laboratory 366 specimens.

Our equipment is very complete to do our work by our present methods, and even for extended methods along certain lines. For very little more it could be brought up to the highest requirements of this class of work.

Our laboratory rooms we rent from the Medical Faculty of the University of Toronto, and they are very well suited for the purpose.

Carbon Monoxide Experiments.

An investigation has been carried on in the Laboratory for some eighteen months as to the effect of carbon monoxide, the poisonous constituent of coal gas, on the body and to see whether it played any part in producing anaemia. For the purpose of experiment guinea pigs were used altogether. The animals were made to live in atmosphere of coal gas of such a strength that a definite fraction of their haemoglobin was saturated with the CO, the strength of the gas mixture being varied at will. The blood of the pigs was examined regularly and the changes carefully noted.

Many interesting observations were made, the chief of which are these:

That guinea-pigs can accommodate themselves to large amounts of coal gas by living in atmosphere of the same. Some of the guinea-pigs lived for 18 months in the coal gas mixture, at first with 25 per cent. of their haemoglobin united with the gas and finally with 45 per cent. of the haemoglobin saturated. The animals are able to withstand the gas because they manufacture new corpuscles and haemoglobin to make up for that thrown out of commission as oxygen carriers by its union with CO. Thus at 25 per cent. saturation the corpuscles increase from 5,500,000 to 8,000,000, while with 45 per cent. saturation the red corpuscles increased to 12,000,000.

Among the white blood corpuscles also there were marked changes. The CO at first produced a leucocytosin the extent of which depended on the saturation of the haemoglobin and the length of time during which it acted. The reaction of the white blood corpuscles were exactly the same as those produced by toxins, e.g., a moderate saturation produced a moderate toxaemia, while a prolonged high saturation produced a severe toxaemia. In severe toxaemia the leucocytin would increase from 6,000 up to 25,000 or 30,000.

The effects on the whole were much the same as those of high altitude or of decreasing the quantity of oxygen in the air breathed. Our experiments go to show that anaemia is not produced in animals living continuously in a CO atmosphere of a constant strength. We conclude that CO acts as a poison purely by the ability to shut off the oxygen supply from the tissues and thereby producing deranged metabolism on account of the abnormal oxidation which goes on. It is this condition of deranged metabolism that calls forth a leucocytosis in the endeavor to combat with the objectionable poisons in the body cells and fluids.

The obvious treatment then in cases of CO poisoning is to get rid of the gas locked up in the haemoglobin as rapidly as possible by fresh air and artificial respiration and to give oxygen until the patient has a high enough oxygen. carrying capacity to keep him going. A guinea-pig will get rid of 70 per cent, saturation with CO in less than two hours. A man will take about seven hours to get rid of this quantity. One must consider that as long as this gas exists in the blood the patient is being oxygen starved and the damage is still going on. The artificial respiration machine used in operating upon animals is an excellent mechanical device for the purpose of keeping up the respiration and should be in every hospital. The body temperature should also be maintained by every possible device and the patient allowed to drink freely on recovery in order to eliminate as rapidly as possible products of excretion which have probably collected in the tissue.

We wish to call attention to this fact, however, that people living in houses with leaking gas pipes are not living continuously in the same, but are living in the gas only part of the time. Our guinea pigs when first placed in the gas even at 25 per cent. appear to be decidedly ill. It is so with human beings. A man sleeps, perhaps, over night in a dilute coal gas atmosphere and rises in the morning with a headache and feeling of nausea. In the open air as the gas disappears from the blood the symptoms abate. But when the process is repeated day after day the subject is in a condition below par all the time and is open to anything that comes along. It is owing to the insidious nature of this process that the very dangerous nature of coal gas poisoning is not generally recognized and we would like to draw the attention of those responsible to the fact that in a large number of houses now being built the connections are seldom tightly made, the general result being leakage into the wall spaces and diffusion into the nearest rooms.

There are several points in connection with this work which pressure of routine work has not allowed us to investigate, one of them an extremely important one in connection with the treatment of anaemia.

The blood counts alone came to nearly 1,000, about 200 of these being differential counts. The amount of work is significant to those who appreciate the work involved in blood counting. The amount of work seemed to very forcibly strike those who commented on the paper at the British Association in York this summer as being something great. It was not all done during Government hours.

Table showing percentage of Proof Spirit found in samples examined for the License Department of Ontario.

Laboratory number.	Taken at	Kind of liquor.	Per cent. proof spirits (by vol.)	Laboratory number.	Taken at	Kind of liquor.	Per cent. proof spirits (by vol.)
	Walkerville	Stout	6.08	5,123	Alliston	Beer	8.37
	"	"	3.05	5,124	"	"	7.38
	Berlin	Beer	3.15	5,236	Sturgeon Falls	"	6.70
3,620a	North Bay	"	4.60	5,286	Manitoulin	Cider	4.04
3,620	"	"	9.58	5,287	"	"	6.13
3,621	"	"	4 83	5,288	"	"	6.76
3,622	"	"	5.60	5,303	Sudbury	"	.75
3,623	"	"	5.11	5,304	"	"	.71
3,624	"	"	5.69	5,305	"	"	5.61
3,625	"	Cider	5.34	5,306	"	"	.93
3,626	"	"	7.38	5,307	"	"	4.73
3,627	"	"	2.66	5,442	New Haverson	"	8.51
3,644	"	"	6.95	5,443	" "	"	6.76
3,884		Wine	.93	5,442b	" "	"	4.87
3,885		"	30.32	5,734	Holstein	Wine	14 10
3,886		"	trace	5,830		Whiskey	77.90
3,887		"	.32	5,831		Gin	96.80
4,068	Ottawa	Cider	7.97	5,832		Cognac	88.10
4,069	"	Wine	17.29	5,833		Gin	83.70
4,070	"	"	20.24	5,834		Malt	83.20
4,045	Cobalt	Beer	4.90	5,835		Whiskey	35.30
4,047	"	"	6.66	5,836		Gin	80.00
4,048	"	"	5.31	5,837		Whiskey	60.40
4,049	"	"	5.04	5,838		"	82.20
4,050	"	"	7.44	5,839		Gin	63.60
4,051	"	"	7.22	5,840		Cognac	66.20
4,052	"	"	5.92	5,841		Whiskey	79.90
4,054	"	"	4.20	5,842	Temagami	Ale	1.42
4,055	"	"	4.41	5,843	North Bay	Beer	.89
4,056	"	"	3.19	5,922	Toronto	"	10.00
4,057	"	"	3.80	6,023	North Norfolk	"	3.23
4,058	"	"	6.86	6,210	Orillia	Cider	7.38
4,059	"	"	4.41	6,701	Parry Sound	Beer	.63
4,251	"	"	4.55	6,702	"	"	3.62
4,252	"	Beer (Regal)	4.55	5,877	Walkerville	Whiskey	78.20
4,061	"	"	2.92	5,728	"	"	72.20
4,062	"	"	4.20	5,729	"	"	77.60
4,063	"	"	3.80	5,730	"	"	77.40
4,064	"	"	7.27	5,876	"	"	81.30
4,065	"	"	3.62	5,731	"	"	79.60
4,066	"	"	7.29	5,732	"	"	79.40
4,067	"	"	4.69	5,733	"	"	79 80
4,080	"	"	3.64	5,833		Gin	83.70
4,081	"	"	6 13	5,834		"	83.20
4,227	"	"	5.78	5,835		Whiskey	35 30
4,226	"	"	4.48	5,836		"	80.00
4,225	"	"	4.29	5,837		"	60.40
4,229	"	"	4.22	5,838		"	82 20
4,194	Copper Cliff	Beer	5.17	5,839		Gin	63.60
4,306		"	5.22	5,840		Cognac	66.20
4,307		"	4.20	5,841		Whiskey	79.9
4,303		"	1.67	5,842		Ale	1.42
4,414		"	3.85	5,843	North Bay	"	.89
4,728	Cross Lake	"	4.03	5,922	Toronto	Beer	10.00
4,739	"	"	6.13	6,023	North Norfolk	"	3.23
4,741		Cider	9.76	6,210	Orillia	Cider	7.38
4,769	Brigden	"	10.16	6,701	Parry Sound	Beer	63
5,041	Toronto	Beer	2.20	6,702	"	"	3.63
5,042	"	"	3.16	7,194	Bradford		19.92
5,043	Sarnia	"	2.92	7,195	"		22.73
5,044	"	"	2.48	7,322	"		23.39
5,122	Alliston	"	8.38				

Medical Inspector's Reports.

By R. W. BELL. M.D.

Presented at the Meeting of the Board held Nov. 14th-16th, 1906.

Report on Diphtheria at Victoria Industrial School, Mimico.

The prevalence of diphtheria in the Victoria Industrial School at Mimico having been reported to your Board in May last, I was instructed by your secretary to investigate the cause and extent of it. My first visit was made on May 26th, when I went pretty thoroughly over the whole premises. I found there had been eleven (11) cases, with twenty-four (24) boys altogether, in the Infirmary, since March 12th, as suspects. There were on the premises at this time two hundred and ten (210) boys with thirty-one (31) employees.

I was also informed that there had been cases off and on for several months prior to that date. Dr. Godfrey of Mimico was the attending physician for the school and he had been unable to find any assignable cause for the outbreak.

The school consists of a group of brick buildings, four of them at present occupied by the boys as dormitories and school rooms; a fifth, burned last fall, is under reconstruction, and a sixth, a handsome new cottage with all modern equipment, is almost ready for occupation. In addition to these there is an administration building with large common dining room in rear, a large gymnasium, workshops, engine house, barns and other out-buildings.

The water supply for drinking and cooking is got from a well 20 feet deep in front of the administration building. For all other purposes it is obtained from two wells, 15 and 18 feet deep, a few yards east of the gymnasium. Occasionally a boy may drink this water from a tap. The tank where this water is stored was cleaned out two months previous, but it is not cleaned at any regular intervals.

Sewers for roof, surface and cellar drainage, with laundry and kitchen water, and boys' urinal run to a cesspool in eastern side of the grounds, and is there pumped to a tank for distribution, through drain tile over a section of the grounds. There is no closet connection with the sewers. A large dry earth closet located near the barns is in use by the boys. In the basement of each cottage there is a single dry earth closet for use of the three or four employees there quartered. All of these are apparently kept in a satisfactory sanitary condition. The sanitary condition of all the buildings was satisfactory except the dormitories, several of which were badly ventilated, and had a very heavy smell, even during the day when they should be well aired. They were overcrowded, in some cases no space between the beds, and the boys had to climb over the ends to get in. In another case there were 38 single beds for 43 boys in one room. There being no closets for the boys in the cottages, the only provision for night accommodation was open buckets in these densely packed rooms.

I repeatedly urged the application of the smoke test to the sewers, but owing to great dilatoriness on the part of somebody, it was not applied until June 26th, when fortunately we found the sewers all tight, connecting with the cottages, etc., the only defect being a broken trap under an outside sink in rear of the kitchen, and the only persons frequenting that neighborhood were not infected. Samples of water were taken from the well and kitchen, and both showed a high per cent. of chlorine, but no bacilli.

I may here note, that the boys ranging from 8 to 16 years of age are not confined to their own cottages, but all mingle in a common dining room at meal hours, also in the gymnasium or on the playground for an hour or two daily, besides in the various school rooms and workshops, one-half the boys attending school in the foreooon and the other half in the afternoon, those not at school working in the trades department, cottages or on the farm.

At the time of my first visit there were seven cases of diphtheria in the Infirmary, located in the third flat of No. 3 Cottage in charge of a trained nurse, and attended by Dr. Godfrey. These were all convalescent, and the other suspects had all been given immunizing doses of antitoxin. It was deemed advisable, however, that I should take swabs from the throats and noses of everyone about the school, for examination by the Provincial Bacteriologist. This I began on May 29th, taking 80 that day, the following day 120, and the next day 49, a few of these being second swabs, in all, however, from 241 different persons, and of these 65 showed infection, with a large number suspicious. Dr. Godfrey and the superintendent of the school were at once informed of the result of this examination, and immediate isolation of all infected cases urged. The superintendent expressed himself as having no faith in the bacteriological examination, and somewhat reluctantly adopted measures for isolation, which, of course, upset the routine work to a considerable extent, and caused some inconvenience. However, No. 3 Cottage was set apart for the infected cases and a dining room prepared there.

On the 1st, 4th, 6th and 11th of June I continued taking swabs, mainly from the previously suspicious cases, several of which now showed infection, and from the infected cases, to see if any were clearing up under Dr. Godfrey's treatment, he, I understand, using antitoxin freely, also gargles. Not more than four or five cases showed any improvement, so on June 19th and 20th I took swabs again from everyone on the premises (241), and found a tremendous increase in infected cases, the numbers now reaching one hundred and seventy-four (174), three of these being from boys who had only been in the school from a few hours to a few days, in fact, one boy who showed infection had only been three or four hours on the premises, had not been in contact with any infected person, had spent all his time asleep in a corner of the office in the Administration building. It is probable this boy came in infected, and just from similar cases likely the infection came originally. By this time the gymnasium had to be used also as an isolation building. The infection was not confined to the boys, several of the employees having it. None of these cases showed any constitutional symptoms, and no membrane formed in the throat or nose. The weather being fine all were out at work or play daily, but entirely separate from the non-infected persons.

On June 26th, 67 swabs were taken; on July 9th, 201; on July 19th, 159; on July 27th, 88; these being from the positive cases or those having yielded one negative result as a rule. During this period the number of cases steadily decreased, although an occasional new one cropped up, until we had 187 infected cases amongst 248 examined. As two consecutive negative results were obtained from any person he was released from quarantine.

On August 2nd I took 125 swabs, covering everyone who showed still positive or only one negative, and the result was 57 positive cases. During the remainder of the month I was from home, and Dr. Amyot paid two visits to the institution, taking on the 14th, 83 swabs, which gave 54 infections, and on the 20th when he took only these 54 cases again and got but five infections. However, he informed me that all these cases bore indications of a recent strong application of some kind to the throat, which has since been confirmed by the superintendent, who told me probably such was the case. As the result of this, everyone but the five positives was released from quarantine, without, so far as I can learn, the consent of anyone connected with this Board.

On my return I visited the school again on September 5th, and with considerable reluctance and protest on the part of the superintendent, was permitted to take swabs from others than the five positive cases at Dr. Amyot's last visit, but I succeeded in taking 67 from those who had only been negative once, and from these, 37 positive cases were found.

Again, on September 27 I took 72 swabs, and 45 proved positive, 8 being from new boys admitted within the last month, showing the infection is on the increase, as the result of releasing from quarantine and allowing to mingle with the others, those who were not free from infection.

As our efforts in carrying on a scientific investigation were not apparently appreciated, suggestions and instructions were ignored, and what was done towards stamping out the infection, was done in a half hearted manner and with a lack of faith as to its necessity, your secretary instructed me to drop the matter for the present.

The absence of severe clinical manifestations of the disease amongst the infected boys at the school was, I am sure, the cause of the authorities there expressing doubt as to the necessity of our investigation, or the need for carrying out our instructions, but that such a condition is not unique, let me quote from the address of Dr. Adair at the Minnesota Sanitary Conference, January 15th, 1902. He says:

"There is no one point which is better settled, I believe, at the present time, and which is of greater importance to us all, particularly to those members of this conference who are concerned and charged with the care of the public health, than that the throats and noses of healthy children are very apt to contain the germs of diphtheria. The child who is furnishing a lodgment for the bacilli of diphtheria in his throat or nose, may himself never have had any of the clinical manifestations of this disease and still be all the time a walking menace to the community."

"The persistence with which the bacilli of diphtheria retain their hold on the throats and noses of healthy children is remarkable."

In the discussion which followed, Dr. Westbrook referring to the diphtheria bacilli says, "Are there groups of well people who do harbor these more than other people? There are." Again referring to how diphtheria is spread he says, "when one watches children at play or school, and sees the freedom with which they blow the same horn, chew the same gum, and do things of this kind, one sees numerous opportunities for the spreading of germ contents of the mouth. We may thus have diphtheria bacilli doing perhaps little harm in the nose or throat of their host, but capable of being passed on to some other person where they may do much harm. I think this leads us to understand how epidemics apparently arise sporadically where we least expect them."

He says diphtheria does its work most noticeably amongst school children, "where it has the very best opportunity; that is in the exchange of contents of the respiratory passages. That, I believe, is more responsible for epidemics than any other means I have referred to."

Dr. Nippert said:—"In coping with diphtheria we have three points to consider:—

"First.—A prompt and positive diagnosis. In this we are greatly aided by the bacteriological examination. If bacilli are found, even if the clinical appearance of the spots in the throat is not that of diphtheria, the diagnosis is certain, and quarantine should be established.

"Second.—The arrest of the disease by the prompt use of antitoxin.

"Third.—The isolation of the patient until the bacilli has disappeared from the throat.

"In my experience, diphtheria is not easily carried by a third person, but is often spread by those who have it in a light form. Such children may go to school while ill with the disease."

Dr. Hall said, "It is also a fact, that the mild cases are the ones that spread the disease."

Dr. Bracken in speaking of the necessity for quarantine said, "they should further bear in mind that quarantine is not for the benefit of the patient, but is for the benefit of the community."

I hope you will pardon me for the length of these quotations, so unnecessary for your understanding of the requirements, but they are given in the hope, that they may strengthen the hands of the representative of your board, or whoever may have to cope further with the epidemic under consideration, or any other similar one. The necessary isolation and quarantine having been abolished, and the former conditions having been reverted to, we may expect cases to crop up (sporadically?) frequently as in the past amongst the inmates, and be not unlikely also communicated to visitors, who carrying it out of the institution to possibly more congenial soil may develop a serious epidemic. The employees closely associated with these boys, and in some cases, themselves shewing the infection, are going out and mingling with our citizens, and are certainly a walking menace to the public.

It looks as if all our work had been undone, one of no small magnitude when it is seen that over 1,700 swabs have been taken and examined, or of we consider there were two each time, one each from the throat and the nose, there were over 3,400.

Can any one conceive of a more suitable place for the spread of the disease than these closely packed dormitories, the common dining-room, gymnasium and play ground, where impossible to avoid inhaling the germ laden atmosphere.

I have suggested that all new boys should be kept isolated for two or three weeks, before being permitted to mingle with the other inmates, and that swabs from their throats be examined, but this has not been done, notwithstanding the fact that I left sterilized prepared swabs ready for use.

A comprehension of the danger involved, and the responsibility resting on their shoulders for not using the means at their disposal to avert it, does not seem to have seized the school authorities, and without their aid and assistance I can do no more.

Report *re* Typhoid Fever in Sudbury and Lumbering Camps in Northern Ontario.

A telegram on Thanksgiving Day from Mayor O'Connor of Sudbury, to your Secretary *re* numerous cases of typhoid fever, coming in from lumber camps, resulted in my departure for Sudbury the the same evening.

On arrival there next day I found matters were not exaggerated—St. Joseph's Hospital and Dr. Struther's Private Hospital were both full, the former having over 40 cases, and Dr. Struther's over 20, while poor fellows seriously ill, were on the streets begging the mayor to send them to the hospital. I at once offered the use of a couple of your double walled tents and other equipment stored there, but the tents were not required, as a building had that day been secured, and was being got ready for the reception of extra patients. However, I loaned a lot of blankets and kitchen equipment to assist in getting these waiting cases under cover, and treatment as soon as possible. This temporary hospital can accommodate about fifteen patients, and in a few days had twelve patients in. An analysis of 50 cases now or recently, in St. Joseph's Hospital shews only about eight cases from Sudbury or local camps. The remainder were nearly all from lumber camps, distributed over a large area from Wahnapitae on the east to Spragge and Cartier on the west, and also several from camps tributary to Webbwood and Massey, in all from over twenty different camps. Some also were from railway construction camps north of

Wahnapitae. Several cases were difficult to trace, the patients being foreigners, and not speaking a word of English. However, so far as I could learn many of these patients after being ill in camp for two or three days, were discharged and turned adrift to look after themselves as best they could, and they naturally turned their steps to the nearest hospital town, in many cases to become a charge upon it. It must be admitted that many of the men leave camp of their own accord when feeling somewhat unwell, and so relieve the employer of the responsibility resting upon him under the Regulations for Unorganized Districts. The sale of hospital tickets has been pushed freely this year by several hospitals, and I have been told that they have been sold far beyond the capacity of the hospitals to redeem with such an epidemic of typhoid as exists in New Ontario at present.

After rendering what assistance I could at Sudbury, I visited the lumber firms at Worthington, Turbine, Nairn, Espanola, Webbwood, Massey, Wahnapitae and Sturgeon Falls, and conferred with them *re* any further cases developing in their camps, and insisted on their making proper provision for them at camp or local headquarters.

A little later, last week I visited Thessalon, Blind River and Cutler. At Thessalon, a hospital of the Victorian Order with 12 beds was full—also a temporary municipal hospital with 11 cases all typhoid, and from various camps. Ten of the cases in the former were men whose homes are in the Province of Quebec. Cases had also been sent from Thessalon to the Soo Hospital. At Blind River there were several cases, and I found Dr. Burd had the previous week opened a private hospital, and had eight cases in. He will have 20 beds available in a few days, and intends enlarging to 60 beds within a year. This is a good centre for a hospital, as there are this year 44 camps with over 4,000 men operating up this stream, and Dr. Burd, who has had contracts with all of the operators on this river in past years, is arranging for a continuance and improved service for the men in his hospital.

Spragge, a lumbering centre, at the mouth of the Serpent River a few miles east, also furnished its quota of cases, as also Spanish Mills, from which place your bacteriologist examined samples of water from the intake pipe and storage tanks, and found both containing Colon Bacilli. I urged the forwarding of samples of water from wells, etc., in several of the places visited, but the local physicians and municipal authorities seem very indifferent, as but few complied.

Certainly an unusually severe epidemic of typhoid has swept over the section of New Ontario from North Bay, or Mattawa to the Soo, the condition of affairs in this later town being dealt with in a separate report. In this unorganized district it is almost impossible to get any satisfactory statistics, as the population is continually on the move, but few having any fixed place of abode. However, there have been several hundred cases more or less severe, but many being of the "walking type," the danger has been much more widespread than it otherwise would be, and water supply everywhere is contaminated. In the towns the blame is laid on men coming from the camps for bringing it in, while in the camps the men who come from the towns are accused of bringing it out. I think both are correct. The recent hot, dry season, with low water, carelessness in not protecting water supply from pollution, and drinking of water from contaminated springs and pools, together with lack of personal cleanliness and correct habits, have been conducive to the spread of the disease, which is, however, rapidly abating with the advent of colder weather.

Report *re* Smallpox in Chatham, Dresden, and Township of Dawn.

The Province is to be congratulated upon the lessened number of smallpox cases within its bounds during the quarter just closed, none requiring my attention in the unorganized districts, and only once have I been called upon to investigate and confer with the local authorities in the more settled portion of the Province.

In July, a report reached your Secretary, that there were cases in Chatham which had been traced to Dresden, and also cases in the township of Dawn not being properly looked after. I therefore visited Chatham on July 20th, and learned from Dr. Hall, M. H. O., and Mr. Mounteer, Sanitary Inspector, that there had been 26 cases in that city between January 1st and June 1st, traced to several different points of infection, but all cleared up by the end of May. On July 11th two cases were developed, both supposed to have come from Dresden, one of the families having come from that town only a few days before, and in this family, another member was found to be desquamating, and still another was said by the mother to have had a similar rash shortly before.

The same evening I visited Dresden, and met the Board of Health, the M. H. O., the Mayor, and one of the M. H. O's. of the adjoining township. All expressed great indignation *re* statements in Chatham and London newspapers, which were attributed to the Chatham M. H. O., concerning carelessness of the Dresden authorities.

Vigorous denials had been published in the press as to carelessness, or the presence of smallpox, by the M. H. O's., of both Dresden and Dawn. It was admitted however that there had been five cases in one family in Dresden in May and June, but the Board of Health acting promptly, and exercising the utmost vigilance and care, had cleared all up, and the house disinfected on June 22nd, and no developments since.

They did not know of the family which had moved to Chatham, until I told them, when they immediately instituted enquiries, and found that the family had moved away during the first week in July, that no physician in Dresden had been in attendance, and so the cases were not reported and therefore unknown. Steps were taken at once to have the vacated house disinfected, and every disposition was shewn to do all required to prevent spread of the disease. It was to be regretted that considerable ill-feeling was engendered by the newspaper controversy, but the Chatham authorities were correct in regard to the cases coming from Dresden, and acted properly in reporting them to the Provincial Board, while possibly a direct communication also to the Dresden M. H. O., in regard to the family which had moved in from there, would have cleared the atmosphere and prevented the subsequent regrettable controversy.

The following day accompanied by Dr. Wiliams, M. H. O. of Dresden. I drove through the Township of Dawn, and met Drs. Chalmers of Oil Springs, and Kelly of Florence, to investigate the suspected cases. No smallpox had been reported from this township, but several cases of rash had been diagnosed as chicken-pox, some attended by physicians and some not. I visited four families in which there had been recently, and still were several cases of undoubted smallpox, and in only one case was there any uncertainty, but even there I suspect it had been a mild case of smallpox. The last house visited was with Dr. Chalmers, who called to see the mother of a large family of small children, who had sent for him that day. She was in bed with suspicious premonitory symptoms, but two of the children were discovered with positive smallpox. The eldest had recently returned home from a month or two stay at one of the previously visited infected families, and her father was in the daily employment of neighboring farmers. None of this family had ever been vaccinated. With the exception of these two children, all the other cases seen were in adults from 18 to 56 years of age. Dr. Kelly undertook to visit some other families where reported suspicious symptoms had been heard of in the direction of Florence.

Dr. Chalmers, M. H. O., undertook to get the local Board of Health together at once, have an effective quarantine established with sanitary police, and take such other steps as necessary to stamp out the disease. I urged wholesale vaccination in the municipality, as the disease was apparently widespread, and there had been many exposures. There had been no fatal cases, but some had been moderately severe, and there should have been no difficulty in the diagnosis.

I am under obligations to Dr. Williams and Dr. Chalmers for kindly assistance in my investigation.

Report on Canning Factories.

By Dr. BELL.

By request made last year, but too late to be acted upon, and again preferred this year, I was instructed to visit with Mr. Holmes, one of the Factory Inspectors, a number of the canning factories, especially in the Niagara district, where sanitary conditions were said to be far from satisfactory, and control over which was to a considerable extent beyond his jurisdiction. From Sept. 10th to 18th, we visited nine different places and inspected sixteen canneries and two evaporators and their surroundings. Nearly all are so situated and constructed that the work can, if so desired, be carried on under satisfactory conditions, but unfortunately the desire does not always seem paramount with the managers.

In many instances we found the employees working in quite an unnecessary amount of slop and water, and under conditions not conducive to their health, but were told by the employers invariably, that had we come on any other day in the season, we would have found everything satisfactory, that a special rush of fruit or vegetables had prevented them cleaning up, etc., etc. Be that as it may, in several instances cleanliness was not a very important factor, neither was the condition of the fruit, and several suggestions were made for improvement, as even a rush does not justify putting up our foods under such conditions.

In the canneries visited are employed about 1,800 hands, two-thirds being females. About one-half the employees are foreigners imported from Buffalo, and a couple of hundred Indians from the neighborhood of Brantford and Caledonia. The employers usually undertake to house this foreign help and provide some furnishings, but not board. In a few cases fair accommodation is provided, although in no case does it come up to anything near the requirements of the Public Health Act, so far as space is concerned. A good honest effort is made in two or three cases to furnish some reasonable comforts, but in too many little else is provided except one stove for each house or shack, and a lot of straw mattresses, these last frequently on the floor, two, three and four of them in a small room, or else placed on low platforms or benches made of a few rough boards. In some cases they are disgracefully huddled together 30 to 40 in one apartment, although in most cases where there are families they are divided off by rough board partitions.

Frequently there is insufficient table accommodation, if any at all, and I saw in different places women and children sitting on the floor or sides of their beds eating their food, which was kept in dirty fruit baskets under the bed. Many of these buildings were filthy dirty, apparently never swept, while scrubbing was not thought of, neither scrubbing dish, mop or broom being about the place. Sometimes one tin washbasin was available for 18 to 20 people. The few dishes used by these people are rarely washed. Waste food lies on the beds where meals are hastily devoured, and flies are in swarms. In one case I saw 14 double straw mattresses on two rough board plaforms for 28 people in one compartment. Adjoining this in an old ramshackle building badly lighted and ventilated and opening into the dark end of a shed, were five upper and lower berths on each side of a narrow passage, the room being about 35x14x7, for 40 people, both these places being filthy dirty and choice places for breeding vermin. Neither wash tub, broom or wash basin was about the place, and on making inquiries as to washing accommodation, I was pointed to a water closet across the yard, in the corner of which was a small iron sink, and here all these people were supposed to perform their ablutions. Do you suppose for one instant they were performed? I admit there was a notice in the factory to the effect that after visiting the closet, hands must be washed. There was neither soap nor towel to be seen, and if hands were washed they were dried on the dirty apron or dress. How can these people be clean under such circumstances? Yet these are the persons who are employed to handle and put up our choicest foods.

On speaking of the dirty help employed, to the managers in several places, they replied that it was impossible to keep these people clean, that they would not use the facilities if they were provided. If such is the case, then I say in the name of all that is righteous, insist on these employers going out of business, who for the greed of a few extra dollars, hire such dirty help and prepare our food under such unsanitary conditions. They complain of the difficulty in getting the required help. I do not wonder at it, as no clean respectable woman would for one hour live in such places as I have described. The fruit canning industry is growing rapidly and if it is not to receive a disastrous shock, the operators must provide clean comfortable quarters for their employees, when I am sure ample help can be obtained from our Canadian cities from amongst those who can and will prepare our foods under such conditions as will be a guarantee both as to cleanliness and quality.

Report on Thorold Water Works System.

By Drs. HODGETTS and BELL.

As the report of Mr. Chipman, the engineer of the proposed Water Works System for the Town of Thorold, which is appended, fully describes the topography of the town, and estimates the quantity of water necessary for all purposes; it will be unnecessary to repeat what has been so well stated in that report. His remarks upon the quality of the water are of particular interest, especially as we cannot agree with his statement that "By removing the turbidity, the canal water would be perfectly satisfactory for all domestic and manufacturing purposes,"—while we do agree with, and heartily endorse the fact enunciated as follows: "For domestic purposes the water supply should at all times be clear, tasteless, odorless, free from sewage contamination, and should be such that future pollution may be guarded against."

We are of the opinion that there exists during the season of navigation not only a strong probability, but an actual pollution of the waters of the canal from the large number of vessels that daily pass up and down the canal. It is during the season of navigation too, that the greatest degree of turbidity exists, therefor for about four months out of the twelve, there is the greatest freedom from pollution and turbidity—for seven months at least there is the possibility of turbidity, and what is most important the danger of frequent daily pollution.

From our personal observations and study of the question we are of the opinion that both sedimentation and filtration by slow sand filters should be the only basis upon which the proposed source of supply from the new canal should be approved, which latter we consider on hygenic grounds more satisfactory than the old canal.

APPENDIX A.

Bacterial Report.

Report on waters received from Dr. Bell, Provincial Inspector of Ontario, on the 19th day of October, 1906, of Thorold specimens.

Laboratory Numbers.	Senders' Numbers.	Where collected from.	Streptococci.	Staphylococci.	Colon Bacilli.	Colonoid Bacilli.	Chlorine in parts per million.
7,258	1	Thorold, Merritton, S. basin, Thorold summit, level of	—	—	+	—	8
7,259	2	Canal at Guard Lock	—	—	+	—	8
7,260	3	Merritton, McLean's tap	—	—	+	—	9
7,261	4	Merritton fountain at Town Hall	—	—	—	—	9

In regard to the appended Laboratory Report we would suggest as they are only indications of the bacterial character of the waters on the date given, viz., October 19th, and do not afford sufficient data thereon, it would in our opinion be better to have specimens collected for a longer period, and covering time both before and after the close of navigation.

APPENDIX B.

Report Upon Proposed System of Water Works for the Town of Thorold.

By WILLIS CHIPMAN, C.E.

Immediately after receiving your instructions to report upon a system of water works for the town, I directed one of my assistants to take certain levels and measuremens, and prepare a draft plan showing the result of his work.

I have also made two personal visits to the town, and now beg to submit the following report:

Topography.—The town is located on the Welland Canal, the artificial waterway that connects Lake Ontario with Lake Erie. The difference in elevation between the two lakes of about 314 feet, is overcome by twenty-five locks, the Town of Thorold being at the head of the locks, and at the Lake Erie level.

The distance from the town to the Lake Ontario entrance of the canal at Port Dalhousie is about seven miles, and to the Lake Erie entrance at Port Colborne about eighteen miles.

There are now two Welland Canals from a point a few miles south of Thorold to Port Dalhousie, the Old Canal which runs through Thorold, Merritton and St. Catharines; and the New Canal which passes around the northeast outskirts of each of these places.

The New Canal is used exclusively for navigation, but along the Old Canal, water powers have been developed for manufacturing purposes at the several locks, about ten powers being within the Town of Thorold.

The surface of the ground throughout the town is undulating rather than hilly, the natural surface drainage being towards the northeast, although now modified somewhat by the canals.

The highest points in town are as follows: 1st, at west side of Old Canal near Cleveland Street; 2nd, at southwest corner of Chapel and Clairmont Streets; 3rd, at the intersection of St. David Street and the town line.

The lowest part of the town lies between Regent Street and Brock Street from the Old Canal northeasterly to the New Canal.

The entire town is underlaid by the Niagara formation, the rock strata lying nearly horizontal, but except at two or three points the depth of clay over the rock is such, that no rock will be struck in trenching for water mains. The plateau breaks away abruptly, immediately beyond the northerly limit of the town, west of the Old Canal, but more gradually to the northeastward.

The Town of Merritton adjoins Thorold to the north, the business section being one and one-half miles from the north boundary of Thorold and about 200 feet lower in elevation.

Population.—The Town of Thorold now has a population of about 2,300, the assessed valuation being $645,000. The population and the assessment may be expected to increase with the establishment of additional industries, and the extension and enlargement of those now in existence. Your town is exceptionally favored, and must become an important industrial centre.

Not only have you a constant water power partially developed and under perfect control, but you now have two of the largest electric power companies in this Province, operating within your town limits, while your shipping facilities by rail or by water alone give you an advantage over many other places.

Quantity.—For a town of 2,500 people all using the water, the average daily consumption should not exceed 100,000 gallons, if all the service pipes were metered, or 200,000 gallons if unmetered, but the maximum during some days would probably double the average.

Assuming a population of 5,000, and unmetered survices, your domestic supply should be sufficient to yield an averoge of 400,000 gallons per day.

Allowing 200,000 gallons for municipal purposes, leakage from mains, etc., the total average daily consumption would be 600,000 gallons, or about 420 gallons per minute. The maximum for a few hours might, however, be as high as 600 gallons per minute.

The present demands would be but a fraction of this, but I believe it prudent to calculate on a population of 5,000 people, all using the water.

For efficient fire protection, four standard streams should be provided, or about 800 gallons per minute. For the present 1,000 gallons per minute for the combined domestic supply and fire supply should be sufficient, but some portions of the works, such as the intake pipe and conduit to pumps, should have a capacity of 1,400 gallons per minute at the least.

Quality.—For domestic purposes the water supply should at all times be clear, tasteless, odorless, free from sewage contamination, and should be such, that future pollution may be guarded against.

The only available source of water supply for your town is the Welland Canal. This water is Lake Erie water, comparatively pure, but at certain seasons extremely turbid, and at all times subject to local disturbances by passing vessels.

The amount of farm drainage that finds its way to the canal is unimportant, when the volume of flow is considered.

The total flow in the canal is about 1,600 cubic feet per second from Lake Erie to the point where water is taken for the DeCew Falls Power Station. From this point northward the flow is about 800 cubic feet per second through the Old Canal, and 300 cubic feet through the New Canal.

As Lake Erie is extremely shallow along the northerly shore, it becomes turbid with every gale, and within a few hours this turbid Lake Erie water finds its way to Thorold.

During the winter months, I am informed, the water is seldom discolored.

By removing the turbidity, the canal water would be perfectly satisfactory for all domestic and manufacturing purposes. This can be effected by filtration, or sedimentation, or both combined.

In my opinion sedimentation alone will give much better results than filtration alone, although the first cost may be somewhat higher, but the operating expenses will be less. If a higher degree of clarification be desired in the future, filters may be added, but as the water is pure except for its turbidity, settling alone will serve the purpose.

Merritton Water Works.—At a point about half a mile south of the southerly limit of the Town of Thorold, the line of the New Canal approaches the Old Canal, but the water in the New Canal south of the last lock (No. 25), is about 7½ feet above that in the Old Canal opposite. At this point between the two canals is located the reservoir of the Merritton water works, with a superficial area of about five acres, and a depth varying from 14 to 18 feet, containing about 5,700,000 gallons.

This reservoir is fed by one 16-inch, and two 14-inch pipes from the New Canal, and serves as a sedimentation basin. At the time of my visit the water in this reservoir was clear, although the water in both canals was quite turbid.

From this reservoir the water flows through a cast iron pipe to Merritton, the static pressure at the Merritton town hall being about 73 pounds. In the southerly part of Merritton the elevation is such that the pressure is only 25 to 30 pounds, but in the manufacturing and busines sections a fair fire service is given.

This conduit follows the east bank of the Old Canal to Ormond Street, thence southerly along this street to the north limit of Thorold.

For a distance of 6,200 feet, the diameter of the conduit is 14 inches, and 12 inches for the remaining distance. For 1,300 feet the inclination is one in 1,000, then one in 500 to a point 300 feet north of Clairmont Street in Thorold.

This conduit cannot supply both towns by gravity, but the capacity might be increased by installing a pump at or near its southerly end, and forcing water through it. This scheme might, however, involve complications with the Merritton corporation, or might cause breaks or leakages due to the high pressure, and I have, therefore, decided to recommend an independent system for Thorold.

System of 1905.—Last year a system of water works was proposed for the town, the supply to be taken from the Old Canal at a point within the town, above lock 25 on the same. At this point a pumping station was to be built, and the water forced through mechanical filters into an elevated tank to be erected on the west side of the canal between Garden Street and Orchard Street.

The pressure from the tank would have given a domestic supply, but for fires it would have been necessary to pump directly into the mains.

It was proposed to operate the pump by electricity generated at the municipal electric light station about 3,000 feet distant at lock No. 24 on the Old Canal.

This proposed system would have given a satisfactory domestic service, but there was apparently no adequate provision in this scheme for fire protection or for auxiliary power.

In case the water were drawn from the Old Canal for making repairs, or due to an accident, the town would have been without a supply and also without power.

It was estimated that a 75 h.p. motor would operate a turbine pump of 700 gallons capacity per minute, and the filter was to have a capacity of 250 gallons per minute.

This system was estimated to cost $50,000, and a by-law for this amount was voted upon on August —, 1905, the vote standing —— for, and —— against.

Source Recommended.—After due consideration, I have decided to recommend that your supply be taken from the New Canal at a point immediately north of the Merritton reservoir, and from the same level.

From this point the water is to be conveyed to a sedimentation basin or reservoir to be constructed about 300 yards to the northward.

If, however, this site for a basin be, for any reason objected to by the Canal Department, it may be constructed at some point further north, but the supply of water should be drawn from as high a level as possible.

The basin will provide storage for several days, so that in case the water be drawn off the canal, the town may be supplied. It might be stated, however, that there is much less probability of the water being drawn down in the New Canal at the upper level, than in the Old Canal upon which there are so many water powers.

In my opinion a supply from the New Canal would prove more reliable than from the Old Canal; it receives less surface drainage, and it is at a higher level; all advantages over the Old Canal.

Pumping Station.—The municipal electric lighting station contains at present one Westinghouse alternator, driven by a Trump water wheel, also an old Little Giant wheel, not now in use, but it is proposed to connect up this old wheel so that both wheels may be used to operate the generator.

I am informed that the entire power is demanded in the winter months to carry the peak of the load, but for the greater part of the day, a large part of the water available for power is running to waste.

Assuming that a basin be constructed as I have recommended, the water may be conveyed from it to a pumping station adjoining the electric light station; or it may be built near the basin, and the water forced from it into the pipe system, or the 1905 scheme may be adopted.

In this last scheme it was proposed to transmit electric current from the electric light station to the pump house. This would have involved a material loss in power, and an engineer would be required at the pump house day and night to start the pumps in case of fire.

In my opinion this pumping station should be combined with the electric light station, as the entire machinery and plant could then be operated and maintained by one staff of employees.

This location being near the centre of the town is convenient, an engineer's residence is not essential, and you now have a lease of the water power.

Your existing electric light station is not a credit to your town. The building above ground is frame, two stories in height, supported upon foundation walls of stone. Previous to the year 1888, it was used as a flouring mill. The town acquired the property and lease of power on January 9th, 1888.

The upper storey of building is of little use except for storage, and I understand that the west wall may soon require rebuilding. The fire insurance on this structure must now be a large item, sufficient probably to meet the interest on the cost of a fire proof building.

I would recommend that the entire frame portion of the electric light building be removed and the stone walls repaired, or rebuilt if necessary. Upon these foundation walls a neat one-storey superstructure of stone should be built, and the main floors rebuilt of concrete supported by steel beams. The basement floor should also be concreted, and roof iron covered, making the building practically fireproof.

Plan.—The general plan of the town which accompanies this report, shows the proposed distribution system, location of fire hydrants, conduit from sedimentation basin, etc.

The full lines show where mains should now be laid to give a fire service, also where in my opinion the revenue to be derived will at once warrant the expenditure.

The dotted lines show extensions that will probably be demanded within a few years.

If you can afford it, the St. David's Road main from Pine or Ormond, across the canal should be included in the system now to be laid, otherwise the west side must depend solely on the pipe across the canal at Albert Street.

Changes may be made in the pipe system, or in the location of fire hydrants without affecting the general scheme.

Cost.—The cost of any municipal work depends upon the design adopted, the permanency or character of construction, as well as its extent.

In towns and cities of the west that are growing rapidly, a much greater allowance must be made for future requirements than in Ontario, but as a general rule the important parts of a water works system, such as intake and force main, should be proportioned of ample capacity for double the present population. If any part of the system must be "pared" down, it is safer to reduce the extent of the pipe system than to lay an intake that will prove inadequate within ten years, or to install machinery that must be soon discarded.

The following is an estimate of cost of the proposed system:—

1. Inlet pipes, gates, etc.		$2,000
2. Sedimentation basin of 3,000,000 gallons capacity		7,000
3. Conduit, 6,000 feet of 12-inch pipe		12,000
4. Reconstructing power house		4,000
5. Machinery:		
Shafting, pulleys, etc.	$1,000	
Water power pump 1,000 gallons minute	3,000	
Electric motor 125 h. p.	2,500	
Wiring and apparatus	500	
		7,000
6. Distribution system, 30,000 feet piping, with 62 fire hydrants and necessary valves		35,000
7. Elevated steel tank of 60,000 gallons capacity on steel trestle 60 feet in height		5,000
8. Materials and labor on 100 water services and meters		3,000
9. Land and right of way		1,000
10. Engineering, advertising, printing and legal expenses		4,000
Total cost of water works system		$80,000

This is $30,000 more than the amount specified in the 1905 by-law, but I am quite satisfied that the system then proposed would have cost $63,000, without allowing anything for service pipes or for an auxiliary pumping system. Adding these two items would further increase this amount by about $9,000, or a total of $72,000 instead of $50,000.

The scheme I recommended will cost $8,000 more than the other, but I am of the opinion that the water from the New Canal, after sedimentation will be superior in quality to the water of the Old Canal after filtration, and I believe that the citizens of the town will agree with me. This is a matter, however, upon which you should obtain the advice of the Provincial Board of Health.

An expenditure of $80,000 for a water works system may at first appear extravagant for a town of your size, but it should be borne in mind that your operating expenses will be extremely light, and on the whole the total annual expenditure will be less than the average town where steam power is used for pumping.

By omitting this proposed sedimentation basin, and substituting therefor a mechanical filter at the pump house, the estimate of cost might be reduced by $2,000, but I believe the cost of chemicals and the cost of renewals of the filtering material would greatly exceed the interest and sinking fund on the additional first cost of the basin.

For a few years you might operate the works without the basin, as the feeder at the north side of Lock 25 will seldom, if ever, be unwatered.

This would give an adequate fire supply, but the citizens would get canal water for domestic uses. It is a matter for you to decide as to whether the expenditure on a settling basin will or will not pay.

I have included but one pump in my estimate. Two smaller ones with a combined capacity of 1,000 gallons per minute would cost about $500 more than one large one. The pump proposed will be operated by either of the water wheels now installed for ordinary domestic service, or when pumping into the elevated tank, but for fire services the large water wheel is to be used, or the electric motor. This motor is to receive current from one of the electric power lines that passes through the town, which current should be available at all times.

I can see no way of decreasing my estimate for machinery or for building, without impairing the system.

The distribution system is decidedly extensive for town with your population. If any pruning is to be done, this part of the system is the one that can best stand it. If, however, you reduce the extent of the system by one-third, you may reduce the prospective revenue in the same proportion, and I have no doubt that within five years the pipes you now omit will be added.

The elevated tank may be entirely omitted, in which case two pumps must be at once installed. The reduction in first cost would be about $1,000, but it would then be necessary to pump continuously night and day.

The items which I have included in the estimate of cost for land, water services, engineering, etc., amounting in all to $8,000, are often omitted by engineers.

I believe that the revenue to be derived from consumers will pay the operating expenses from the first, and that if you allow a reasonable amount for fire protection, the works will be self-sustaining at the end of five years.

The Steelton Water Supply.

By CHAS. A. HODGETTS, M.D.

In reference to the application of the municipality of the Town of Steelton for approval of the plans of a public water supply as submitted by Mr. W. Chipman, C. E., I beg to report as follows:—

The municipality has at the date of reporting nearly completed the laying of the mains in the town. It has not, however, proceeded with that portion of the work which provides for the intake for several reasons, and to permit of a better understanding of the situation a few words of explanation are necessary.

The inhabitants of the town are chiefly employees of the Lake Superior Power Company, which company at present controls the water supply of the Town of Sault Ste. Marie, and since the passage of the by-law for the construction of the system upon Mr. Chipman's plans, the Tagona Water and Light Company have made a proposition to supply water from the same source as at present supplied to "the Soo," upon what would appear very reasonable terms. The municipal authorities being anxious to secure water at the cheapest rate, provided the standard of purity is the same in both instances, await the decision of the Board as to the relative purity of the water from each of the two sources, viz.: (1) That proposed by Mr. Chipman, in the deep channel of the river above Steelton, and (2) That offered by the company, being the water taken from the power canal of the Lake Superior Power Company.

The laboratory analyses of samples taken by "the Soo" authorities from different points in that town's system are herewith submitted, together with photographs taken by Dr. Bell, showing the portion of the river immediately above the headgates of the power canal, also plans showing the relative situation of the rapids, the boat channel to the canal and the power canal, and the relationship of the outlets of the Bennet and Davieaux Creeks and the ore docks to the latter canal; also the situation of the American water and power courses. From a study of these it will be seen that the waters coming down the Soo River are at this point divided into natural and artificial channels - the former being the unnavigable St. Mary's Rapids, the latter the three-ship canals and the two power canals. The main body of water, of course, finds its way down the natural channel. The water reaching the power canal passes between the extended upper entrance pier of the Canadian Ship Canal and the ore dock at the blast furnaces, at the northern extremity of which empties Davieaux Creek and further west Bennet Creek.

The natural bay formed north of the western prolongation of St. Mary's Island and Davieaux Point has become further land-locked by the extension of the upper entrance pier and the ore dock, and here we find the company have from three to six boats tied up each day during the season of navigation, each with from twelve to twenty of a crew—at the time of inspection there were seven vessels at the docks. By reference to the map it will be noted the Canadian Ship Canal crosses the mouth of this inlet or bay and through this a large body of water flows during the season of navigation, the only other outlet is that of the power canal, and as this is constantly open, except during repair, very naturally the trend of the waters will be towards this head-gate, and from the volume passing through the canal the suction must be very considerable, and floating material, unless blown by northeast winds out of the inlet towards the natural channel to St. Mary's Rapids, must tend to accumulate around the head-gate. Such Dr. Bell and myself found to be the case as shown by photographs taken on the 3rd inst., when we observed debris of different kinds both above and below the head-gate. Without discussing the matter in detail I am of the opinion that it is a physical impossibility for the municipality of Steelton to secure a pure water supply from the Power Canal –one that can with certainty be free

The possibilities of pollution were much less before the ore docks were built and vessels were tied up at this point, but from the personal examination of the branches of the Davieaux Creek, upon which I found were situated dairies, pig-pens and slaughter houses, the proprietors of which were, in some instances, and have been for some time depositing offal and animal waste therein, clearly indicate, in my opinion, there has been for some time past a constant pollution of these waters above the head-gates and this pollution still continues.

I have not in my arguments allowed for possible contamination from the many vessels passing up and down the river during the season of navigation, many of which no doubt add their quota of excrementitious material, some of which will be carried into this bay and so find access to the proposed source of supply.

Under the circumstances here narrated I would recommend the board to approve of the Town of Steelton taking its supply from some point in the river above all possible source of pollution, possibly at such a point as indicated in the plans of Mr. Chipman, or at some other convenient point further west. Further, the board should order the discontinuance of the Steel Plant system in so far as it relates to that portion of the Town Steelton, known as Tagona.

APPENDIX A.

Report Upon a System of Water Works for the Town of Steelton.

By WILLIS CHIPMAN, C.E.

I beg to submit for your consideration the following report upon a system of municipal water works for the Town of Steelton, with estimate of cost, accompanied by a plan of the town, showing the proposed system of mains and source of supply.

Topography.—Your town site is an extended one, comprising an area of nearly three square miles, with a length from east to west of about two and one-half miles. The extensive works of the Steel Trust, which employs over 1,200 men, the sawmill and the veneer mill occupy the greater part of the water front along the Upper Saint Mary's River, above the head of the hydraulic power canal and the Canadian ship canal, but the eastern third of the town, which adjoins the Town of Sault Ste. Marie, is the most densely populated.

Two streams flow through the west part of the town, Bennett's Creek and Davieaux Creek. The first discharges into the river between the veneer mill and the sawmill, the latter between the sawmill and the steel plant.

Davieaux Creek forks within a short distance of its mouth, one branch flowing from the northwest, the other from the northeast. The land along the river is low and marshy for a distance of about a quarter of a mile, and the entire western area is less than twenty feet above the level of Lake Superior.

The eastern part of the town is drained by Fort Creek, that enters the lower St. Mary's River between Andrew Street and Huron Street, in the Town of Sault Ste. Marie.

The river above the canals has an elevation of about eighteen feet above the water below the canals.

On the whole the town is a plain, slightly undulating, quite a large proportion being bush land and scrub.

Soil.—In the western section the ground is wet and marshy along the river. Going northward a strip of deep sand is crossed; further northward the sand is underlaid with clay within two or three feet of the surface. In the central and eastern parts of the town several low ridges of stones and gravel are met with, low wet clay land intervening.

With the exception of the half mile along the river front the excavating will not be difficult.

Population.—The town now has a population of about 2,500, the assessed taxable valuation being about $1,000,000. The debenture debt is less than $25,000, and the rate of taxation only 14 mills.

With a proper water supply the town should rapidly increase in population.

Source of Supply.—With the outlet from Lake Superior at the western end of the town, from which to draw an unlimited supply of the purest water in the world for all time, it is unnecessary to discuss but briefly other possible sources. The streams that flow through the town drain several thousands of acres of level land, largely tilled fields and pastures. Water from these streams would be unsafe for domestic uses without thorough filtration, an expensive process.

It is quite probable that an adequate supply might be obtained from wells sunk in the north part of the town, but this can only be determined by making extended tests.

I was not informed of any large springs within the town limits or contiguous thereto during my visit, and I therefore infer that there are none worth considering.

The water flowing through the hydraulic canal day and night the year round has the enormous volume of 8,000 cubic feet per second. Upon reference to the plan of the town it will be seen that this entire flow passes between the head of the ship canal, upper pier, and the commercial dock, a distance of only 1,200 feet, the depth varying from 21 feet to 30 feet. Above the commercial dock the depth increases to 50 feet in half a mile.

If the town supply be taken from any point well within this immense and rapid stream it would certainly be free from shore contamination.

I have shown on the plan an intake pipe extending directly southward from the south end of Goulais Avenue, between the veneer mill and the sawmill. Detailed soundings may show that a divergence of this intake to the westward would be advisable, but this change would not affect the scheme. This location will require an intake pipe 2,800 feet in length, but in my opinion this will cost less than the extra cost of a force main if a more western location were selected.

This location is also most desirable from its proximity to the lumber mills, as doubtless some mill refuse may be obtained for fuel, and a coal dock may be built for a moderate sum at any time in the future.

Pump House.—The pump house should be located as near as possible to the source of supply. I have shown it at the river bank, but it may be built further inland if desired. It is quite probable that pile foundations will be necessary for machinery and masonry walls.

The building should be practically fire proof, and of sufficient size to accommodate two steam boilers, and two pumping engines. If electric power can be obtained at such a price that it will be cheaper than steam, then one of the pumping units may be electrically operated.

Brick or concrete walls resting on concrete foundations with metal roof and concrete floors will in the end prove less expensive than a building partially of wood, but if the foundations are found to be difficult to construct, or expensive, it may be necessary to economize on the pump house, but I have estimated on an up to date building.

Force Main.—I have shown on the plan the proposed force main from the pump house to the eastern part of the town as following the street northerly, easterly and southerly. The location shown may however be changed without affecting the system.

The distance from the pump house to the intersection of St. George's Avenue and Wellington Street by this line is 16,400 feet or over three miles.

When pumping 625 imperial gallons per minute through this length of cast iron pipe, the friction loss would amount to 30 pounds in a ten-inch pipe, and 13 pounds in a twelve-inch pipe; or 1,000 gallons per minute can be pumped through the twelve-inch with the same pressure as 625 gallons through a ten-inch. To pump 1,000 imperial gallons per minute through 16,000 feet of ten-inch main, and give a pressure of 85 pounds at the easterly end of the line would require a pressure of 150 pounds at the pump house, a high pressure, but not higher than is carried at many other places. A twelve-inch main will cost about thirty cents per lineal foot more than a ten-inch main.

Fire Service.—The consumption of water in the town, if all the people were supplied, would not exceed an average of 150,000 gallons per day, but in hot summer weather the demand might be double this rate, or say 200 gallons per minute. Deducting this from the carrying capacity of the ten-inch force main would leave 800 gallons per minute, or four extra good fire streams. If the force main were twelve inches in diameter the fire supply would be sufficient for six or seven effective fire streams.

The buildings in the town are low, three stories being the maximum; there are few business blocks, no manufactories and no dangerous fire risks. It is a residential town, principally detached residences, and water for domestic supply is more important than for fire protection.

The steel plant and property adjoining is now provided with an independent water works system, the supply being taken from near the commercial dock, pumped to a stand pipe or water tower 150 feet in height, from which it flows by gravity to the hydrants.

A twelve-inch force main will cost about $5,000 more than a ten-inch.

It is a question for you to decide as to whether you will adopt the larger force main or the smaller, or lay part of one size and part of the other, but I am of the opinion that a ten-inch will suffice.

Reservoir.—There is no hill in town upon which to construct a reservoir. In every small city or town it is economy to provide storage, so that the pumping machinery may be shut down at night, thus saving fuel and attendance.

I would recommend that a water tower or stand pipe be erected in the eastern part of the town, either at the point shown on plan southwest of Wellington, opposite Boydell, or at some other point to be selected near the force main. The exact location is immaterial.

A water tower 20 feet in diameter and 80 feet in length will give a satisfactory domestic pressure, and will hold 156,000 gallons. Only the upper forty or fifty feet will be available for domestic use, but it will cost but little less to construct a cylinder from the ground up, than to erect a steel tank on a steel trestle, and there is less danger from freezing. During last winter the water tower at Port Arthur was not injured in the least by ice or otherwise.

Distribution.—The distribution system shown in the plan comprises the following mains:—

1.	Wellington, John to North	1,500	feet of	8	inch.
2.	Wellesley Crescent, Wellington to Edinburgh	200	"	4	"
3.	Edinburgh, North to C. P. R.	800	"	4	"
4.	Gloucester, Wellington to Cathcart	500	"	4	"
5.	Brown, Wellington to Cathcart	700	"	4	"
6.	Wellesley Crescent, John to Beverly	900	"	6	"
7.	John, Wellesley to Cathcart	900	"	4	"
8.	St. James, Wellesley to Cathcart	850	"	4	"
9.	Huron, Wellesley to Cathcart	800	"	6	"
10.	Beverly, Wellesley to Cathcart	700	"	4	"
11.	John, Wellesley to Kehoe	2,400	"	6	"
12.	Parliament and Boydell, Wellington to Byrne	2,000	"	6	"
13.	St. Andrews, John to North	1,100	"	6	"
14.	St. George, Wellington to Beverly	400	"	4	"
15.	St. George, John to Bush	350	"	4	"
16.	Bush, St. George to Cornwall	450	"	4	"
17.	Bloor, Northland to Bush	1,300	"	6	"
18.	Charles, Bloor southerly	350	"	4	"
19.	People's Road, Wallace to Henrietta	1,200	"	6	"
20.	Conmee, Henrietta to Lennox	700	"	4	"
21.	Fourth, Douglas northerly	450	"	4	"
22.	Third, Douglas southerly	450	"	4	"
23.	Albert, Goulais o Goetz	1,100	"	6	"
24.	Albert, Goulais to Glasgow	900	"	6	"
	52 hydrants	500			
		21,500 feet			

Summary.

1,500 lineal feet of 8-inch water mains.
11,700 lineal feet of 6-inch water mains.
7,800 lineal feet of 4-inch water mains.

21,000 lineal feet.
500 lineal feet 6-inch hydrant branches.
52 hydrants.
15 10-inch valves.
1 8-inch valve.
15 6-inch valves.
14 4-inch valves.

44 valves.
16,000 lineal feet of 10-inch force main.

Cost.—I estimate that the cost of the proposed works will be as follows:—

Land and right of way	$1,000
Intake pipe	9,000
Pump house	6,000
Pumping machinery	8,000
Force main, 10-inch	27,000
Water tower	7,000
Distribution system, 21,500 feet, with 52 hydrants	21,000
Water services	3,000
Engineering and contingencies	5,000
Total	$87,000

By substituting two-inch galvanized pipes for the four-inch cast iron pipes on some of the streets the cost may be reduced by about fifty cents per lineal foot.

I am of the opinion that on some of the streets which you desired me to include in the distribution system it will not at present pay to lay water mains as the prospective revenue to be derived will not equal ten per cent. of the cost.

I am further of the opinion that if you raise from $80,000 to $85,000 for water works purposes that it will be quite sufficient.

Revenue.—Assuming that the same water rates are charged in Steelton as in Sault Ste. Marie, and the same amount allowed for fire protection in proportion to the number of fire hydrants, the proposed works should be self-supporting within a few years, and the revenue from consumers alone should pay operating and maintenance from the first, the allowance for hydrant rental meeting the greater part of the interest charges.

The following may be taken as an approximate estimate of your revenue for the next five years:—

Year	Population	No. of Services	Revenue
1907	2,500	100	$1,500
1908	3,000	200	$3,000
1909	3,500	250	$3,750
1910	3,800	300	$4,500
1911	4,000	350	$5,250

To the foregoing should be added a reasonable amount for fire protection, based on the number of hydrants set, and something should also be charged for the water used for all municipal purposes, schools, etc.

Operating Expenses.—For the next five years at least, one man at the pump house will be sufficient to look after the machinery and do the pumping. The superintendent of your streets should be able to supervise the laying of the water services that will be required in town, and make any necessary repairs.

Owing to the level character of the town the expenses of pumping will not be as great as in many other places, and the consumption of fuel will probably run from half a ton to one ton per day, during the first five years.

Your operating expenses should not exceed $2,000 per year for a few years.

On the whole there is a good prospect of your water works system becoming a valuable municipal asset.

Report on the Proposed Improvements of the Sewerage System of the Town of Waterloo.

By Drs. HODGETTS and AMYOT.

The present disposal plant has been in operation for some years and consists of some four acres of land divided into what may be considered a rather crude septic tank and filter (?) beds of a rather questionable character as regards material and capacity for efficient treatment of the septic tank effluent. The conditions of what is called in the Engineer's report a "farm" were such at the time of our visit as to indicate that the municipality maintained a poor supervision thereof.

The inefficiency of the present disposal plant is evident from the subjoined Laboratory Report, to which reference is made in that of the Engineer, who further sets forth very clearly the essentials of an efficient sewage disposal system (see subjoined report), and recommends as follows: The construction of two concrete septic tanks of a combined capacity of 250,000 gallons which he estimates as the amount of one day's dry weather flow, also the construction of three and one-half acres of artificial sand and gravel filter beds, plenty of which material is in close proximity to the present works.

After a careful inspection of the present plant and study of the Engineer's report and the question generally, we would recommend the approval of the Engineer's plans with the exception of that portion relating to the area of the filter beds, which in our opinion should include the whole of the present property owned by the municipality and the extending of it to the portion of property lying between that now in their possession and the edge of the creek, by which nearly five acres of filter beds would be constructed, thus permitting of a more efficient treatment of the effluent.

We would point out that if at any time it is found necessary to further treat the septic tank effluent by some system of aeration this can be readily done.

In our opinion a competent and efficient officer should be placed in charge of the whole sewerage system and disposal plant as this is essential to the proper working of the same.

APPENDIX A.

Report on Improvements to the Sewerage System of the Town of Waterloo.

By WM. MAHLON DAVIS, C.E.

I have made an examination of your sewerage system and of the sewage discharged thereby, in order to determine the best means of ultimately disposing of the sewage.

The present population of Waterloo is 4,000. The dry weather flow of sewage amounts to 255,000 gallons per 24 hours; in wet weather this is increased to 350,000 gallons per 24 hours. The average amount of water pumped daily is 350,000 gallons. There is very little difference between the daily and the nightly flow of sewage. This would indicate the existence of many leaky joints in the sewers, and the dilution of the sewage by a large quantity of ground water. Since the sewage may be disposed of without pumping this dilution has no disadvantage except to reduce the carrying capacity of the sewers.

The existing sewage farm covers about four acres of land, the soil is clay and gravel, through which the sewage filters very slowly. Samples of sewage were forwarded to the laboratory of the Provincial Board of Health for analysis, taken from the following sources, on the 25th June.

3. Raw sewage taken from sewer outfall at the farm.
2. Filtered sewage taken from subsoil drains at the farm.
1. Water taken from the creek below the farm.
4. Water taken from the creek below Seagram's stables and above sewage farm.
5. Water taken from creek above Seagram's stables.
6. Water taken from creek above the town.

The results of these analyses are as follows:

PARTS PER MILLION.

No.	Free Ammonia.	Alb. Ammonia.	Chlorine.	Remarks.
1	2.35	1.05	20	Creek below sewage farm.
2	5.65	1.35	30	Sewage filtrate from tile drain.
3	20.25	8.25	35	Raw Sewage.
4	1.50	.47	6	Creek below Seagram's stables and above Sewage farm.
5	.65	.35	8	Creek above Seagram's stables.
6	.62	.45	2	Creek above town.

As the albumenoid ammonia is the most objectionable constituent of the sewage we may base a comparison with other samples of sewage on the quantity of albumenoid-ammonia present in each.

The essential features of a sewage disposal system for the Town of Waterloo are:

1. The effluent must be at least as pure as the water of the creek above the outfall of the sewerage system.

2. The system must be simple, capable of operation by unskilled attendants, and free from mechanical automatic devices which are liable to get out of order.

3. The works must be so designed that they may be extended to provide for the increased volume of sewage consequent upon the growth of the town.

4. The system proposed must be as cheap as is consistent with the other requirements.

The works now in use do not properly purify the sewage, and a change either in the extent or the character of the works is necessary. With the soil similar to that in the existing beds, at least 40 acres would be necessary to give satisfactory results, and even with this area it is questionable whether the system could be satisfactorily operated during the winter.

The system of disposal which has had the longest test on this continent, and has given the best satisfaction and the best uniform results is that of "intermittent downward filtration," and where the system can be operated by gravity costs less to maintain.

In this system the sewage is filtered through beds of sand or gravel which have been previously undermined; since the beds are used intermittently each bed has a rest after a close of sewage, the interstices become refilled with air, and so long as the beds are not overworked there is no falling off in efficiency. The outlet of your trunk sewer is at such an elevation that a gravity system of this sort is practicable. On account of the unsuitability of the adjacent soil natural filter beds are out of the question. There is, however, a large body of sand and gravel within one-quarter of a mile of the outlet of the trunk sewer, admirably adapted for the work of filtration, which would render the construction of artificial beds practicable.

The area of filtering material required depends on the composition of the sewage. It has been found in practice that the area of filter beds necessary can be reduced by a preliminary treatment of the sewage in septic tanks.

I am of the opinion after a careful consideration of the situation, and of the conditions affecting the disposal of the Waterloo sewage, that the most satisfactory plan that can be adopted is to pass the raw sewage through septic tanks, afterwards filtering the effluent through artificial beds of sand and gravel.

In order to show the results obtained elsewhere by the method I am recommending I shall give the following results of analyses from plants in two town in Massachusetts and in Berlin.

PARTS PER MILLION.

City.	Aver. Gals. per acre.	Free Ammonia.	Alb. Ammonia.	Chlorine.	Percentage of Purification.
Brockton, Mass.—	35,000				
Raw Sewage		30.10	13.60	65.9	99
Effluent		1.766	.123		
Framington, Mass.	27,500				
Raw Sewage		31.00	31.45	84.5	99
Effluent		6.38	.176		

These plants consist of filter beds with septic tanks.

City.	Aver. Gals. per acre.	Free Ammonia.	Alb. Ammonia.	Chlorine.	Percentage of Purification.
Berlin.					
Raw Sewage		45.00	21.25	405	53
Septic Sewage		23.75	10.00	285	
Bed No. 2.					Overall
Filtrate	42,000	1.25	1.10	120	97.6
Bed No. 3.					
Filtrate	42,000	8.65	.50	200	97.6

The Berlin samples were collected in the month of February, a season unfavorable for a high percentage of purification.

I would advise the construction of two concrete tanks with grit chambers of combined capacity of 250,000 gallons, or about one day's dry weather discharge of sewage.

Taking into consideration the comparative strength of Berlin and Waterloo sewage, the beds should be designed to filter 105,000 gallons of sewage per 24 hours, or about 3½ acres for the total daily flow. The beds should be prepared by excavating to the required depth, placing the excavated material in embankments, then underdrained and afterwards filled in with sand and gravel from the neighboring hills. The effluent would be carried to the beds by large earthenware pipe laid underground, and then diffused over the beds by open distributors.

A certain amount of sludge will collect in the septic tanks and grit chamber, which will require periodical renewal, that from the septic tank not oftener than once a year, but the deposit in the grit chamber, which will be chiefly sand from street washings, will require more attention; the latter can be discharged by gravity on a specially prepared bed near the creek, but as the septic tank will be deeper, pumping will be required to empty it. However, since the work of cleaning these tanks will only be necessary at long intervals the cost will not be serious.

It may be in the future necessary to give some preliminary treatment to factory sewage before permitting its discharge into the sewers, but the only work of this sort necessary at the present time is a screen chamber at the brewery to catch any barley husks which are in the sewage, and which are most objectionable on account of their tendency to sludge up the filter beds.

I estimate the cost of the work proposed as follows:

ESTIMATE.

Two covered concrete septic tanks, capacity 250,000 imperial gallons, with screen and grit chambers		$5,954 60
Grading of filter beds:		
18,188 cubic yards @ 25 cents		4,547 12
Sand and gravel filling:		
22,587 cubic yards @ 20 cents	$4,517 40	
Land and right of way	500 00	
		5,017 40
Extension of sewer		120 75
Sewage carriers and distributors		777 80
Underdraining		731 00
Sludge bed and drain		705 75
		$17,854 42
Add ten per cent for contingencies		1,785 58
		$19,640 00

Report on the Water Works System and Sewerage System of the Town of Preston.

By Drs. HODGETTS and AMYOT.

The plans together with the report of Mr. W. Mahlon Davis, C. E., upon the proposed systems of sewerage and water works for the Town of Preston, have been carefully considered, and the ground gone over in company with the engineer, the mayor and town clerk.

We beg to report as follows:—

(*a*) *Water System.* This being of primary importance in every municipality we consider should receive first consideration, and will be dealt with only from the sanitary standpoint as to quality and quantity for domestic use. The three sources discussed by the engineer are—(1) The River Speed. (2) Springs at the base of the hills to the north of the town. (3) Artesian wells.

In our opinion the first would require the installation of a filtration plant, and while giving an ample supply would entail both an initial expenditure and an annual cost in running expenses, which would make the plan prohibitory to a municipality of three thousand persons. From the presence of mineral springs in the town, it is doubtful if a potable supply could be secured from artesian wells although such is not improbable.

The engineer is of the opinion the many springs found at the foot of the hill to the north of Preston, will, if developed, give an adequate supply for all purposes. The flow of water at the time of our inspection, Sept. 20th, 1906, was considerable, notwithstanding the fact a dry spell of some duration had preceded our visit. The waters are cold, clear, palatable and hard. It is possible the opinion of Mr. Davis as regards quantity may be verified by development, if so, we would recommend those springs as the source of supply, providing, however, that samples prove the waters to be free from bacterial and chemical infection, and the springs safeguarded against the possibility of surface infection in a manner satisfactory to the board. We would also recommend that it shall be part of the provisoes of the board giving its consent to the scheme that a system of metering must be adopted by the municipal council.

The system of supply is that of pumping with direct pressure by steam power with a stand pipe 80 ft. high placed on a lot situated on the hill on Abraham St., adjacent to the centre of the town, the total cost being placed at $46,000.00.

(*b*) *Sewerage System.* The plan of the sewerage system as submitted by Messrs. Davis and Johnston, the engineers in charge of the works, divides the town into two sewage areas, the more westerly of which will drain toward the River Speed, while the other will follow the valley of the small creek which lies to the east of Lowther St., and empties into the Grand River.

It will thus be seen the ultimate distribution of the westerly portion of the town sewage will be the Grand River, and to prevent pollution of the waters it is proposed to construct a septic tank for the westerly portion of the system at some point adjacent to the junction of the Speed and Grand Rivers, and provide for intermittent filtration through the alluvial soil found at this point.

As regards the sewage of the easterly portion of the system, the proposal of the engineers is to treat first, by septic tank, and secondary by coke contact beds, as there is no natural deposit of alluvial soil just at this point suitable for the purpose.

The reports and plans of the engineers show a most careful study of the two propositions particularly as regards the sewerage system wherein provision is made for the treatment of the sewage whereby pollution of the waters of an important river will be obviated.

We would recommend the approval of the plans with a slight modification as to the method of treatment of both septic tank effluents, which in our opinion would be attended with better results if sand filters were constructed.

We would further recommend that the municipal council be required to adopt a set of plumbing by-laws which shall be satisfactory to the board, and that they place the system in the hands of a competent town official and the system shall for all time be maintained at a standard satisfactory to the board as to efficiency in treatment of the sewage.

APPENDIX "A."

Report on System of Water Works, Town of Preston.

By W. MAHLON DAVIS, C.E.

I have the honor to report as follows on a system of water works for your corporation.

I have read the report submitted by Mr. H. J. Bowman in 1902, and on most points concur in the conclusion arrived at by him, though the changed conditions caused by the rapid growth of the town necessitate a rearrangement of the distribution system, and the rise in the cost of labor render the sum provided in the report inadequate.

The system proposed should fulfil the following requirements: 1st. Adequate protection from fire for all property within the corporation.

2. A plentiful supply of water suitable for domestic and industrial purposes.

Source of Supply.—There are three sources from which it is possible a satisfactory supply may be obtained, viz.:

1. The River Speed could provide water in abundance, but it would require filtering before it would be suitable for domestic purposes.

2. Springs east of the Preston and Berlin R. R., at the base of the hills, north of the town, yield excellent water, and though the quantity in sight does not exceed some 200,000 gallons per 24 hours, it is probable they could be developed at small expense so as to double this quantity.

3. Artesian wells would probably furnish the cheapest supply if the water can be obtained free from objectionable mineral qualities.

System of Supply.—The only system of supply practicable is pumping with direct pressure by steam power. There is no elevation in the vicinity sufficient for a reservoir, but a stand pipe of suitable size placed in the hill on Abraham Street would furnish sufficient water and pressure for the early stages of a fire, and obviate the necessity of running the pumps at night. The estimate provides for one compound Duplex pump with steam tubular boiler. This plant will answer all demands for some years to come, but will doubtless require to be duplicated in the future.

Location of Pumping Station.—As a location for the pumping station, the town park, near King Street, is most favorable. I would advise sinking an eight-inch test well at this point. If unsuccessful in obtaining a satisfactory supply from this source, I shall then recommend springs, but whether springs or artesian wells be decided upon, the pumping plant must be kept within reach of the River Speed, because that is the only available supply, the permanence of which is absolutely certain. A storage reservoir at the pumping station would be a necessary part of the system.

One objection which may be made to the site proposed is its liability to overflow by the river in the spring. This must be guarded against by keeping the works above high water mark. A certain amount of material for the grading will be available from the reservoir excavation.

Distribution System.—In designing this system the first consideration has been given to fire protection. The town has been gridironed by large mains, and the hydrants are so located that from four to six hydrant streams may be brought to bear on almost any point in the town where they may be required. Hydrants on the business street are located at intervals of 400 feet.

The elevation above sea level of the different street corners are given in feet on the plan. From these it will be seen that a stand pipe 80 feet in height on Abraham Street will give a hydrant pressure of about 65 pounds per square inch in the business part of the town.

The question of supplying water to consumers has been treated as of secondary importance because, with the large mains once laid, the smaller pipe may be added as fast as the revenue from consumers will justify the expense.

I estimate the work proposed as follows:

ESTIMATE.

Two artesian wells 8-inch drain	$1,000 00
One covered storage reservoir, capacity 7,000 gallons	1,100 00
Pumping station	2,500 00
L compound duplex steam pump and boiler feed pump	2,000 00
Boiler and heater	1,400 00

DISTRIBUTION SYSTEM.

1,124 feet 12-inch pipe at $1.70	$1,910 80	
4,686 feet 10-inch pipe at 1.41	6,607 26	
5,293 feet 8-inch pipe at 1.04	5,504 72	
15,799 feet 6-inch pipe at .75	11,849 25	
3,500 lbs. special castings at 3¼c.	1,137 50	
56 hydrants with connections, at $37.50	2,100 00	
Valves and boxes:		
3 12 at $44.50	133 50	
10 10 at 31.50	315 00	
8 8 at 20.50	164 00	
22 6 at 11.50	253 00	
		29,975 00
Steel stand pipe 18 feet diameter 80 feet high on concrete foundation		5,000 00
		$42,975 00
Add for contingencies		3,025 00
		$46,000 00

I have the honour to be.
Gentlemen,
Your obedient servant,
DAVIS & JOHNSTON,
Engineers.

BERLIN, November 13th, 1905.

APPENDIX "B."

Report on Sewage System of the Town of Preston.

By W. MAHLON DAVIS, C.E.

The Town of Preston for sewerage purposes must be divided into two watersheds, the most westerly can be drained along Water Street, parallel with the River Speed to the Grand River, and the other along the valley of the creek which crosses King Street east of Lowther Street.

The streets of the town have as a rule steep gradients, and can in most cases discharge the surface water into the natural watercourses without any great length of storm drain. I do not, therefore, consider it advisable to provide for this storm water in the sewers, and would recommend the adoption of the "separate" system of sewerage, in which the sewers are designed for the carrying off of sewage only. By this means the cost of that system can be kept within reasonable bounds, and the problem of disposal of the sewage is simplified.

The present is an opportune time for the consideration of the construction of sewers and the laying of water mains. The work of improving the roadways is only beginning, and before any permanent work is undertaken, it is of the utmost importance that all sewers and water mains, with the necessary connections, should be laid on the streets, otherwise much of the money expended will be wasted.

The Grand River must ultimately receive the sewage of the town, but the regulations of the Provincial Board of Health require its purification to protect the waters of the river from pollution.

For the west watershed I would advise treatment in septic tanks and subsequent disposal by intermittent filtration through the alluvial soil. The tank will remove the greater part of the organic matter and the after treatment on the land should produce a satisfactory filtrate. At the outfall for the east watershed the soil is of a different character, and the rock is close to the surface, so that natural filter beds are out of the question. I would, therefore, advise in addition to a septic tank, coke contact beds instead of the land treatment recommended in the former case, but from which equally good results may be claimed.

The plan which is submitted shows a complete system of sewerage for the town, although many of the sewers shown would not be required for many years. I am of the opinion that the best plan would be to construct the following parts of the system first.

(*a*) West disposal works.

(*b*) West trunk sewer from the outfall to King Street, and along King Street westerly across the River Speed.

(*c*) East disposal works.

(*d*) East trunk sewer extending northerly from the Grand River to the corner of Duke and Lowther Streets.

In constructing the separate system of sewerage it is usual to provide a second pipe below the sewer for the drainage of cellars and the subsoil. In the case of the west trunk sewer this would be unnecessary on account of the proximity of the territory drained to the River Speed, but the case of the east trunk sewer is different, a subsoil drain would be very necessary, and should have sufficient capacity to remove the subsoil water from the swampy land above Duke Street, leaving the storm water to find its way through the existing channel. In the estimate which follows a 12-inch drain is provided for this purpose.

ESTIMATE.

West disposal works:		
Land and right of way	$375	
Covered tank of concrete, capacity 40,000 gallons	1,400	
Grading and draining beds	1,600	
		$3,375
West trunk sewer:		
1,500 feet 15-inch sewer pipe at 44c.	$660	
1,386 feet 12-inch sewer pipe at 33c.	457	
Trenching and backfilling	1,843	
Manholes	316	
		3,276
East disposal works:		
Land	$150	
One tank	1,400	
Coke contact beds	1,952	
		3,502
East trunk sewer:		
3,500 feet 12-inch pipe for sewer.		
2,000 feet 12-inch pipe for subsoil drain.		
5,500 feet at 33c.	$1,815	
Manholes	264	
Trenching, laying and backfilling	1,990	
		4,069
		$14,222
Add for contingencies		1,422
		$15,644

A by-law would require to be submitted to the ratepayers to authorize the raising of the necessary funds by a general assessment extending over a term of years.

The extension of the system would then follow, as a necessity for the sewers arose, petitions being presented to the council under the Local Improvement Act.

I should estimate the cost of these lateral sewers at $1.30 per lineal foot, including the cost of all house connections to the property line, or 65 cents per foot frontage on each side of the street.

To provide for this amount would require an annual tax of 3¾ cents per lineal foot for thirty years.

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